

UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF MASSACHUSETTS

BEFORE THE HONORABLE GEORGE A. O'TOOLE, JR.  
UNITED STATES DISTRICT JUDGE

**JURY TRIAL - DAY FORTY**

John J. Moakley United States Courthouse  
Courtroom No. 9  
One Courthouse Way  
Boston, Massachusetts 02210  
Thursday, March 26, 2015  
9:13 a.m.

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I N D E XDirect   Cross   Redirect   RecrossWITNESSES FOR THE  
GOVERNMENT:

DAVID McCOLLAM

By Mr. Chakravarty                            6                            45  
By Mr. Watkins                                    35

EDWARD S. KNAPP

By Mr. Chakravarty                            47                            140  
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JENNIFER HAMMERS

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E X H I B I T S

## GOVERNMENT'S

<u>EXHIBIT</u>	<u>DESCRIPTION</u>	<u>FOR ID</u>	<u>RECEIVED</u>
1387A	Complete text of Exhibit 1387		5
1230-10	Photograph contained in 2-D exhibit		35
3102	Photograph of hobby fuse		42
1573	Photograph of IED explosion		69
1582	Photograph		89
957A	Photograph of Exhibit No. 957		94
1122A	Photograph of Exhibit No. 1122		95
949A	Photograph of Exhibit No. 949		98
652	Campbell autopsy photograph		167
655	Campbell autopsy photograph		169

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GOVERNMENT'S <u>EXHIBIT</u>	<u>DESCRIPTION</u>	<u>FOR ID</u>	<u>RECEIVED</u>
654	Campbell autopsy photograph		171
651, 656 659	Photographs of foreign objects recovered during Campbell autopsy		172
657-A, 658-A, 659-A, 660-A 661-A	Swabs and foreign material collected at Campbell autopsy		178

DEFENDANT'S <u>EXHIBIT</u>	<u>DESCRIPTION</u>	<u>FOR ID</u>	<u>RECEIVED</u>
3093	Fragmented remains of cardboard		147

## PROCEDINGS

2 THE COURT: Morning, jurors.

3 THE JURY: Good morning, your Honor.

4 THE COURT: Just two matters before we continue with  
5 the evidence. There were two issues from yesterday. After  
6 review, I will admit the proffered 1387A, proffered by Mr.  
7 Fick, which is the complete text from which selections were  
8 made. That will be admitted.

9 (Exhibit No. 1387A received into evidence.)

00:00 10 THE COURT: There was a discussion of a couple of  
11 photographs, and I will -- that I had expressed some concern  
12 about. Those may be used. I'm satisfied that the reason --  
13 there is a value added for those that is not available from the  
14 other evidence.

15 MR. CHAKRAVARTY: Your Honor, just to clarify, 1387A,  
16 that would be with the redactions that we had discussed?

17 | THE COURT: Yes. You mean personal identifiers?

18 MR. CHAKRAVARTY: Correct.

19 THE COURT: Yes. And I don't have a copy that has  
00:00 20 that, but I'm sure one can be prepared. All right.

21                   MR. CHAKRAVARTY: Your Honor, the government would  
22 call David McCollam.

23 THE CLERK: Sir, want to step up here, please, up to  
24 the box, if you would. Remain standing.

25 DAVID McCOLLAM, Sworn

1                   THE CLERK: Have a seat. State your name. Spell your  
2 last name for the record. Keep your voice up and speak into  
3 the mic.

4                   THE WITNESS: My name is David McCollam,  
5 M-c-C-o-l-l-a-m.

6 DIRECT EXAMINATION BY MR. CHAKRAVARTY:

7 Q. Good morning, Mr. McCollam.

8 A. Good morning.

9 Q. Do you work at the FBI?

00:02 10 A. Yes.

11 Q. What do you do there?

12 A. I'm a chemist forensic examiner assigned to the Explosives  
13 Unit.

14 Q. Are you a special agent?

15 A. I am not.

16 Q. What did you do before you joined the FBI?

17 A. I was a tour guide at the FBI while I was in college; and  
18 before that I was just a student majoring in chemistry at Old  
19 Dominion University.

00:02 20 Q. Is that your entire education?

21 A. Yes.

22 Q. After you graduated with your chemistry degree, when did  
23 you join the FBI?

24 A. I started off in the Chemistry Unit in August of 1995.

25 Q. And can you describe your progress through the FBI

1 laboratory and the various roles that you've had there?

2 A. In August of 1995, I was assigned in the Chemistry Unit to  
3 a supervisory special agent who worked with explosives. As his  
4 chemist, I trained under him and other qualified examiners  
5 learning the proper chemical techniques and instrumental  
6 techniques that we utilize at the laboratory to identify  
7 explosives or energetic materials.

8 A wide variety of training samples or practice samples was  
9 part of my training. At the end of that particular training, I  
00:03 10 would take a series of batteries of competency tests. At the  
11 end those competency tests, I was then able to work  
12 independently within the laboratory. I've taken past yearly  
13 proficiency tests. And then in January of 2000, there was a  
14 reorganization of the laboratory where we got shifted over to  
15 the Explosives Unit. And then in July of 2004, I became a  
16 qualified forensic examiner.

17 Q. What is a qualified forensic examiner?

18 A. The extra training, aside from the bench chemistry that I  
19 was trained in the Chemistry Unit, it's just a series of  
00:03 20 writing reports, working with more samples, a series of oral  
21 board evaluations on explosives, administrative functions  
22 within the laboratory.

23 Q. You mentioned something called bench work. What's bench  
24 work?

25 A. Bench work is just analyzing evidence that's submitted to

1 the laboratory using different procedures, techniques, to get  
2 those chemicals, residues or explosive material onto the  
3 instruments that we utilize on a daily basis.

4 Q. What is the purpose of forensic chemistry in explosives  
5 investigation?

6 A. With forensic chemistry, we're just using very scientific  
7 principles to identify explosive compounds or compounds that  
8 can be used to make explosives with a wide variety of analytic  
9 techniques, scientific methods, to arrive at a conclusion.

00:04 10 Q. What kind of explosives can you test for?

11 A. Pretty much everything. There's a wide variety of  
12 different type explosives. There are low explosives. There  
13 are high explosives. There are hundreds of different types of  
14 explosives that exist that we're able to analyze and identify.

15 Q. Now, continuing with your background, as you progressed as  
16 a chemist at the FBI lab, did you have an opportunity to  
17 actually conduct forensic examinations on submissions,  
18 evidentiary submissions, for testing for chemicals?

19 A. Yes.

00:05 20 Q. And approximately how many times have you conducted  
21 forensic chemistry exams in explosives cases?

22 A. Literally thousands of samples involving hundreds of  
23 different cases.

24 Q. Was your work peer-reviewed on a general level, and on  
25 specific occasions did people verify your work?

1 A. Whenever we -- or I write a report at the laboratory, the  
2 data that I generate, the report that I've written, has to go  
3 through a technical review process. So there's another chemist  
4 examiner who has the same qualifications, who's been through  
5 the same training process that I have. That individual would  
6 review the report and the technical data with my conclusion;  
7 and if he agrees with it, then he'll sign the report out.  
8 There's also administrative review that's done as well in  
9 conjunction with that.

00:06 10 Q. And do you work with a team of various analysts, agents,  
11 and examiners?

12 A. Correct.

13 Q. In the course of your work at the FBI, have you had an  
14 opportunity to continue continued education or on-the-job  
15 training?

16 A. Yes. The FBI mandates that we have to have approximately  
17 eight hours of continuing education, so that can exist either  
18 by taking classes which are sponsored by the instrument  
19 manufacturers that I use at the laboratory to study the theory,  
00:06 20 or I can take, you know, explosives classes that are offered.  
21 There's a wide variety of those. I can attend conferences on  
22 explosives with the United States or overseas as well.

23 Q. Have you continued to do that --

24 A. Yes.

25 Q. -- during your time, now almost 20 years at the FBI?

1 A. Yes.

2 Q. Now, as part of the Boston Marathon investigation, what  
3 was your role?

4 A. I stayed back at the laboratory, and then I started  
5 receiving many submissions on April 16th centered around the  
6 investigation. So it was my job to coordinate the efforts in  
7 the laboratory that evening. Many samples were received from  
8 the two devices at Boylston Street, the incident at Watertown,  
9 and then in subsequent searches during the following weeks of  
00:07 10 the investigation.

11 Q. And, ultimately, did you analyze that evidence?

12 A. Yes. Myself and my team analyzed approximately 300 pieces  
13 of evidence.

14 Q. Did you draft a report?

15 A. I did.

16 Q. Did you prepare to come up here to testify in the case?

17 A. I did, yes.

18 Q. Have you testified in other cases?

19 A. I have.

00:07 20 Q. About how many times?

21 A. This is my tenth time.

22 Q. That's always in this capacity of talking about explosives  
23 chemistry?

24 A. Correct, yes.

25 Q. What is an explosive?

1 A. An explosive can be described as a pure substance or a  
2 mixture of substances that's capable of producing explosion by  
3 its own energy. What they're designed to do is they're  
4 designed to react very quickly, within thousandths of a second  
5 or hundreds of thousandths of a second. And all they're  
6 designed to do is just release a tremendous amount of gas, and  
7 that gas is generated. It's designed to do work, to blow stuff  
8 up in mining, engineering or, with military applications, just  
9 to shatter and destroy things.

00:08 10 So since there's so many different types of explosives and  
11 they react differently, they have to be classified into two  
12 different categories. We have low explosives and high  
13 explosives. And they're based on how quickly they react. So a  
14 low explosive, the material that's reacting is going at less  
15 than the speed of sound. A high explosive, on the other hand,  
16 reacts faster than the speed of sound. So examples of high  
17 explosives you may have heard of would be TNT or C4, dynamite,  
18 nitroglycerin. Those are all military-type explosives that we  
19 can see.

00:09 20 On the other hand, we have low explosives. These are  
21 commonly referred to as propellents. They're mixtures of  
22 different chemicals. They're mixtures of oxidizers and fuels.  
23 Now, in order to get that fuel to burn, it needs a chemical  
24 source of oxygen. It's like I stated earlier, they're designed  
25 to work or react so quickly they can't take oxygen from the

1 air, can't diffuse that fast, so we have to bring in a chemical  
2 source of oxygen called the oxidizer. There are many different  
3 types of oxidizers out there: potassium nitrate, potassium  
4 perchlorate, barium nitrate. And all they do is supply that  
5 oxygen to the fuel, which could be carbon or sulfur, aluminum  
6 powder, magnesium as well.

7 Low explosives, pyrotechnics are low explosives, and also  
8 propellents. A propellant would be, like, black powder or  
9 smokeless gunpowder, which is commonly found in ammunition.  
00:09 10 And for pyrotechnics, that category, it's used by the military  
11 for signaling, like, smoke grenades. You can find them in  
12 common household kitchen matches, road flares, signaling  
13 flares, and also commercially available pyrotechnics or  
14 fireworks.

15 Q. So you talked about two different types of explosives:  
16 high explosives and low explosives.

17 A. Yes.

18 Q. High explosives, I think you explained, are military grade  
19 or they're commercially available for the specific purpose of  
00:10 20 blowing things up essentially?

21 A. Correct, yes.

22 Q. And low explosives, can you describe some of the  
23 nondestructive applications of low explosives?

24 A. Again, low explosives are -- like I said, they're road  
25 flares, kitchen matches. There's pyrotechnic material that's

1 on there. Black powder, people can go to, as a hobby, black  
2 powder guns, Civil War reenactments, Revolutionary War  
3 reenactments. Those guns or canons use the black powder. When  
4 it burns, it reacts. It generates that pressure very quickly,  
5 and it's designed to propel something. And then fireworks,  
6 Fourth of July, stuff like that. And then the smokeless  
7 powder, that's the ammunition propellant. People -- some  
8 people are reloaders. So they can go to, like, Dick's Sporting  
9 Goods store or Wal-Mart, and they can buy pounds of smokeless  
00:11 10 powder, and they can reload their own ammunition instead of  
11 buying it.

12 Q. So what is the difference between how high explosives  
13 explode versus how low explosives explode?

14 A. Low explosives are designed to deflagrate or burn, so  
15 typically they're initiated with a match or some type of heat  
16 source, whether it's a hot wire or a match. And that gets the  
17 reaction going. It's very easy. It's very simple to do.

18 On the other hand, most high explosives need to have some  
19 type of shock initiation to them. They're relatively  
00:11 20 insensitive but they need a shockwave, typically in the form of  
21 a detonator, to get them to go. For example, TNT, if I had a  
22 block of TNT for demonstration purposes and I took a match to  
23 it, it would burn but it wouldn't detonate because there's not  
24 enough energy to get those molecules to decompose to react to  
25 achieve a shockwave.

1       So in the blasting industry or military operations, they  
2 have commercially available blasting caps. So there's energy  
3 put into that blasting cap which starts the explosive train, we  
4 call it. There's a shockwave that's developed within that  
5 blasting cap, and that blasting cap then propagates that  
6 shockwave to the TNT to get it to go.

7 Q. And how does the low explosive work?

8 A. Again, it could be a simple match, like a firework.  
9 There's a fuse sticking out of it. You light a match. It's a  
00:12 10 safety fuse, so you can light it and then get away in time, so  
11 you could have some type of hot ember or hot -- it's just  
12 energy. That heat has to come from some form of energy. It  
13 could be a flame. It could be a hot wire. It could be  
14 friction is generating energy just enough to get those  
15 molecules within that low explosive to start decomposing to get  
16 that energy going that it needs to sustain the reaction.

17 Q. And so for low explosives to actually explode as opposed  
18 to just burn, do they need to be contained?

19 A. Yes. If I -- for example, if I bought two cans of black  
00:13 20 powder and we went outside and I demonstrated by taking one can  
21 and pouring it on a surface, and I took a match and I lit that  
22 black powder, you would feel the heat from the thermal  
23 decomposition. You would see smoke. It would be white smoke.  
24 You would smell the sulfur burning. Black powder is potassium  
25 nitrate, oxidizer, sulfur, and carbon as the fuels. They're

1       burning in that oxidizer. So you would see this reaction. It  
2       wouldn't explode. It's relatively harmless other than just,  
3       you know, the awe of it. If I take that same amount of powder  
4       from the second can, which is a pound of it, and I put that in  
5       some type of container, now what's happening is that gas that I  
6       talked about earlier that's being generated, that pressure that  
7       has built up, it has to go somewhere. It cannot stay within  
8       that container. So that pressure, as it builds up over time  
9       very quickly within that container while the material is  
00:14 10      burning, that pressure is going to overcome that container in  
11      some fashion causing it to peel apart, bust open. That's the  
12      explosion that you're hearing. The black powder isn't  
13      exploding. It's a chemical reaction. It's causing a  
14      mechanical explosion which is the failure of the container  
15      which it's contained in.

16      Q. And how quickly does that process happen?

17      A. Low explosives are designed to function or react  
18      thousandths of a second. In contrast, high explosives are  
19      designed to react one, one-hundred-thousandths of a second so  
00:14 20      several orders of magnitude quicker. It's a relatively slow  
21      reaction, but on a chemical scale, it's pretty quick. For us  
22      to interpret how fast it's reacting, we have a wide variety of  
23      instruments or engineers that study these compounds. There's  
24      all these instruments they use to understand the reaction rate,  
25      the pressure that's generating, and how fast the reaction is

1 going.

2 Q. When you see an explosion, are there signals from the  
3 observations that you can make about the explosion that might  
4 tell you whether it's likely a high-explosive or a  
5 low-explosive explosion?

6 A. When explosives react, you know, the energy that they  
7 release is in the form of heat, light, and sound. If you're  
8 looking at an explosion going off, you're going to see the  
9 light that's going off. You're going to hear it as a loud  
00:15 10 sound. But there's another process or another -- not a flaw,  
11 but what happens with some of the military-type explosives,  
12 like TNT, if I initiate a pound of TNT, there's going to be a  
13 black cloud that's associated with that because there's a lot  
14 of extra carbon within TNT. There's not enough oxygen to react  
15 with that. So that carbon soot goes away, and that's the cloud  
16 that we see.

17 On the other hand, with low explosives, there is a lot of  
18 oxidizer left over. Some of the products that they're forming,  
19 when they start off and they're burning, the products that are  
00:15 20 left behind are a little bit different. But when they release  
21 their gas and energy, there is all these different types of  
22 compounds, and they're typically white in color.

23 Q. So one distinction is a white plume of smoke versus a  
24 black plume of smoke?

25 A. Correct.

1 Q. Now, in addition to examining explosives when they're in  
2 their bulk form or they're intact form, are you able to do  
3 post-blast investigation?

4 A. Yes.

5 Q. And how do you do that?

6 A. Post-blast, we're just looking for residues. There may be  
7 microscopic traces of material left behind. So there's various  
8 procedures that we go through, rinsing them with the material  
9 that comes in with chemical solvents, water and then acetone.  
00:16 10 It's a screening technique that we're achieving. Based on the  
11 results from those screening techniques will navigate as to  
12 other instruments that we may use.

13 Q. What is the purpose of doing that kind of a post-blast  
14 forensic examination?

15 A. Like I said earlier, there's going to be little bits of  
16 residue left behind, so we're using these solvents to determine  
17 what explosive may have been used to cause the explosion.

18 Q. And can you determine using that process specifically what  
19 brand of explosive was used, or what's the level of specificity  
00:17 20 that you can arrive at?

21 A. With low explosives, it's practically impossible. It's  
22 difficult to determine what brand it was or anything like that.  
23 We don't try to determine, you know, the manufacturer or  
24 anything like that.

25 For high explosives, it's a little bit easier. For

1 example, TNT I talked about earlier. If that material goes  
2 off, there's microscopic traces of TNT residues left behind. I  
3 can state with confidence that the explosive contained TNT  
4 within there. Whereas, with low explosive, we can't determine,  
5 like, a particular brand name or a manufacturer that made that  
6 material.

7 Q. Now, did you examine the evidence from the Boston Marathon  
8 investigation?

9 A. Yes.

00:18 10 MR. CHAKRAVARTY: Mr. Bruemmer, if we could just call  
11 up Exhibit 620.

12 THE COURT: This is 620 which is in evidence?

13 MR. CHAKRAVARTY: It is 620 in evidence, your Honor.

14 Q. Now, Examiner McCollam, starting with Boylston Street, did  
15 you examine evidence from a variety of the places where it was  
16 collected on Boylston Street from the blast scene of Scene A?

17 A. Yes.

18 Q. Examining that evidence, did you arrive at a conclusion as  
19 to what the nature was of the explosives involved?

00:19 20 A. Yes.

21 Q. What did you conclude?

22 A. That the residues that were present from the specimens  
23 that were submitted from Scene A, those residues are consistent  
24 with the deflagration products of a pyrotechnic or  
25 firework-type material.

1 Q. And with regards to Scene B, again, did you examine the  
2 evidence submitted that had chemical residues on it and  
3 determine the nature of the explosive for Scene B?

4 A. Yes, I did. Again, the residues from Scene B are  
5 consistent with the deflagration products of a low-explosive,  
6 pyrotechnic-type material.

7 Q. Did you also examine the evidence submitted from the  
8 Watertown crime scene?

9 A. Yes.

00:19 10 Q. And that included both a pressure cooker device as well as  
11 several pipe bombs?

12 A. Yes.

13 Q. Did you also examine the intact, rendered safe, pipe-bomb  
14 material?

15 A. Yes.

16 Q. Did you also examine the bulk powder that was in a  
17 Rubbermaid container that had not been ignited?

18 A. Yes.

19 Q. And did you conclude -- draw any conclusions about the  
00:20 20 nature of those explosives?

21 A. Yes.

22 Q. What were those?

23 A. The bulk material was definitely pyrotechnic  
24 flash-powder-type material.

25 Q. Now, can you explain to the jury what a pyrotechnic

1 flash-powder-type material is?

2 A. Pyrotechnics are designed for our amusement. They're  
3 Fourth of July-type events. They're made here in the United  
4 States, but the bulk of fireworks are made in Asia. They're  
5 brought over. And, again, it's just a combination of  
6 oxidizers. There's chemical sources of oxygen mixed with the  
7 various types of fuel. And the fuel specifically, they're  
8 highly reactive fuels such as aluminum or magnesium. That  
9 flash that you see, that bright flash is aluminum or magnesium  
00:21 10 burning.

11 Q. Are there combinations of commercially available  
12 pyrotechnics, are they consistent in terms of what elements are  
13 contained within those?

14 A. It's a very complex process how they make them, and it  
15 depends on the customer who's ordering the fireworks, what they  
16 want. All these different chemical oxidizers that go in there  
17 have a various function. Not only are they designed to supply  
18 the oxygen during the reaction but the element that's  
19 associated with them as well. For example, barium nitrate,  
00:21 20 they add barium nitrate to fireworks because that burns green.  
21 So when you're watching fireworks burn, if you see green, it's  
22 because the oxidizer barium nitrate is in there. If you see  
23 red, that means that the oxidizer strontium nitrate is in  
24 there. If you see blue, then you have copper salts or copper  
25 nitrate, various compounds that are in there. So the engineers

1 and the people that make this stuff understand the different  
2 colors that these chemicals produce, so they can design these  
3 fireworks. So when they're burning in the sky, those materials  
4 that you see burning are because of the different elements and  
5 the different oxidizers that are associated with them.

6 Q. All right. And so when you conducted your analysis of  
7 each of those various crime scenes and pieces of evidence, can  
8 you explain to the jury how you did that?

9 A. So when the evidence came in, there were many, many pieces  
00:22 10 that came in. Both from the Scenes A and B were big pieces of  
11 metal fragment. In observing those pieces of metal, I could  
12 see black-colored material, discoloration on there, residue  
13 that was left behind. There was also swabs from the scene. We  
14 swab surfaces that can capture residue. And also vacuum  
15 samples were submitted as well both from Scene A and B and then  
16 the Watertown incident as well.

17 So what myself and my team did is that we -- if the piece  
18 of metal had black residue or discoloration on there, if we  
19 were able to scrape that off, we would set that aside for  
00:23 20 further analyses but decided to focus our analyses -- since  
21 there were so many items, to focus our analyses on a technique  
22 called ion chromatography. What I'm doing with that is there's  
23 a water wash that I'm using, so I rinse the items with water.  
24 I filter that water. And then what it's designed to do is  
25 these organic -- sorry, inorganic compounds, those oxidizers

1 I'm talking about, are soluble in water. So they're going to  
2 be trapped within the water. It's kind of like a chemical  
3 soup. So this material goes on the ion chromatograph system.  
4 We call that IC. That IC system separates out all those  
5 individual components based on how much time they want to spend  
6 in the system. So I can get -- say, for example, if I had  
7 eight compounds, I could separate out those eight compounds.  
8 These are called anions. They have a negative charge to them.  
9 So I can determine if there's chloride, if there's nitrate, if  
00:24 10 there's sulfate, if there's perchlorate, all these different  
11 ions that are associated with that. It's just a piece of the  
12 puzzle.

13 Next step would be to analyze that black residue material  
14 that we scraped off. We'll grind that up in a mortar. That's  
15 going to go on a system called an X-Ray Diffractometer. We  
16 call that XRD. What that XRD system does is its sample is  
17 sitting in an instrument, and X-rays are focused on that  
18 sample. And what the sample does is it rotates through  
19 predetermined degrees. It goes from approximately 5 to 75  
00:24 20 degree angle. And those X-rays that are focused on the  
21 instrument -- or, sorry, the sample will diffract at certain  
22 angles because of the crystal lattice structure of the sample  
23 that's in there. No two chemicals have the same crystal  
24 lattice. We can only do this for solid material. We can't do  
25 it for liquids or gels or anything like that. It's only for

1 solid material. So it develops what we call a diffraction  
2 pattern which is unique to those specific chemicals or crystal  
3 structures. If there's a mixture in there, it can easily  
4 separate the mixtures out and give me a diffraction pattern.  
5 And that diffraction pattern is searched against a known  
6 library of materials that's associated with the instrument.

7 Finally, that black material is then going to be analyzed  
8 by an instrument called Scanning Electron Microscopy with  
9 Energy Dispersive X-Ray Spectroscopy. That's a mouthful, so  
00:25 10 we'll just call that SEM. So what the SEM does, well, there's  
11 a detector called the EDS detector. What that detector does is  
12 it determines the elemental composition of the material that's  
13 in there. It doesn't determine structure or anything like  
14 that. It just determines what elements are present. So a lot  
15 of these samples contain carbon. They contain oxygen, silicon,  
16 sulfur, barium, potassium, chlorine, aluminum, magnesium, all  
17 chemicals that are commonly found in pyrotechnic material.

18 Q. Similarly, are those elements not commonly found on  
19 Boylston Street and on Laurel Street in Watertown?

00:26 20 A. No.

21 Q. Now, once you have identified a number of the different  
22 chemicals, how do you conclude -- what can you do with that  
23 combination of the various chemicals that you have? How do you  
24 use that information?

25 A. Well, then we just -- once all the data has been

1       collected, we sit down and I start going through all the data,  
2       all the notes. And that's when I start arriving at the  
3       conclusion that these materials present are consistent with the  
4       deflagration of pyrotechnic materials. I've analyzed cases  
5       from fireworks before, people making flash powders. We've seen  
6       it many times before. I've burn them myself; I've analyzed  
7       them myself. So I arrive at that conclusion, and that's when  
8       the report process starts to be written.

9       Q.      You drafted a report. I suspect that's the report in  
00:26 10     front of you, is that right?

11      A.     Yes.

12      Q.     The analysis you described can tell you what kinds of  
13       materials were used. Can you tell how much of that material  
14       was used?

15      A.     You can. There's a technique called quantitation,  
16       determining how much of something you have. The Explosives  
17       Unit on the chemistry side, we don't quantitate anything.  
18       We're just trying to determine what's present. Is there an  
19       explosive there or not. So I did not determine how much of  
00:27 20       anything was present.

21      Q.     Now, a pyrotechnic mixture comes from fireworks, right?

22      A.     They can. Like I said earlier, there's pyrotechnics for  
23       road flares, kitchen matches; the military uses it for various  
24       applications. It not just fireworks, but that's a common  
25       source of it.

1 Q. For a civilian who doesn't work in those other industries  
2 which use fireworks -- excuse me, which use pyrotechnics, how  
3 would one extract from a firework the pyrotechnic mixture that  
4 would be the explosive that you described?

5 A. Someone would have to mechanically go into the pyrotechnic  
6 device to get the filler or the explosive material out of  
7 there. For example, a small firecracker, the small, little  
8 cylindrical objects you see, by law, they can only have 50  
9 milligrams of material inside of that. But yet there are other  
00:28 10 commercially available fireworks that are sold that can contain  
11 up to hundreds of grams of pyrotechnic material, all legal,  
12 depending on what state you live in and how the laws are set up  
13 where you can buy them.

14 But somebody would have to actually go in, cut through the  
15 cardboard. Those cardboard tubes and some of those materials  
16 are relatively thick. Again, that thickness of the cardboard  
17 is to contain the pressure so that the firework could be  
18 projected vertically. So there's a lot of effort that will go  
19 into separating out the pyrotechnic or firework explosive.

00:28 20 Q. What would happen if you have pyrotechnic mixture from a  
21 variety of different low-explosive sources so, like, black  
22 powder as well as firework flash powder as well as other types  
23 of things?

24 A. They all burn pretty much the same. Flash powder burns or  
25 fireworks burn a little bit hotter than just regular black

1 powder. But they will function -- if they're mixed together,  
2 they pretty much function the same.

3 Q. And to extract from fireworks a pound of explosive --  
4 low-explosive material, about how many fireworks would that  
5 require?

6 A. Again, it depends on what has been purchased. Some of the  
7 products -- like I said, the firecracker would be not worth  
8 your time because there's only 50 milligrams. There's 454  
9 grams in a pound, so that wouldn't be a good way of doing it.  
00:29 10 But there are mortars that you can buy. Certain states sell  
11 mortars. They can contain up to maybe 30 grams or more of  
12 explosive material within them. So if you're looking for a  
13 pound, 30 grams, 454 grams in a pound, you would need dozens of  
14 those mortars just to create a pound of explosive material.

15 MR. CHAKRAVARTY: Can we call up Exhibit 1230-10? I  
16 believe this is in evidence.

17 Q. Do you recognize that?

18 A. I've seen the picture before, but I don't know if I've --  
19 I believe I analyzed it in the lab in a different form. When  
00:30 20 it came into the laboratory, it had already been dismantled or  
21 taken apart.

22 Q. All right. Can I show you Exhibit 1256-04?

23 MR. CHAKRAVARTY: Which is also in evidence, I  
24 believe.

25 Q. Do you recognize that?

1 A. Yes.

2 Q. Does that appear to be a disassembled version of the  
3 earlier photo?

4 A. Yes.

5 Q. And what did you analyze that to be?

6 A. So I mechanically removed some of the powder that you can  
7 see from the different firework-type material, and the powder  
8 that was contained within is pyrotechnic, low-explosive  
9 material.

00:31 10 Q. If you can estimate, without precision but just as a  
11 ballpark, how many of these you would need to extract a pound  
12 of explosives?

13 A. It would be quite a lot, hundreds, I would guesstimate.  
14 It's really inaccurate, but it would be hundreds because  
15 there's not a lot of material. There's three different kinds.  
16 You can see there's a Roman-candle-type product up at the top.  
17 I didn't analyze that. But then you can see those from, I  
18 guess, south to north, you can see finger-type or long  
19 cylindrical-type materials. There's a couple milligrams or a  
00:32 20 gram or so of material within each of those. And then off to  
21 your left at about 9:00 or 10:00, there's more cylinders that  
22 are chained together with a fuse. I opened up one of those.  
23 There's approximately a half a gram to a gram of material  
24 within each one of those.

25 Q. Did you have various receipts and other exemplars of other

1 fireworks that were purchased as part of this investigation  
2 that you analyzed?

3 A. Yes. One sample was sent down to us.

4 Q. Was there a lock-and-load mortar kit that you examined?

5 A. Yes.

6 Q. Was that the largest firework that you examined?

7 A. Yes.

8 Q. And how many of those would you need to create a pound of  
9 explosive material?

00:32 10 A. If I recollect correctly, the lock and load, one of those  
11 mortars contained a little bit more than 30 grams, about 35  
12 grams of material. So, again, you would need a couple dozen of  
13 those to get up to a pound.

14 Q. In order to extract explosives from firework materials,  
15 can you describe how clean or dirty that process is?

16 A. In my experience, it's a pretty dirty process. Again,  
17 because -- when I've talked about the low explosives, oxidizers  
18 and the fuel, the most common fuel used is aluminum powder  
19 because it's cheap and it's very reactive. So that's pretty  
00:33 20 much the go-to fuel for a lot of these firework manufacturers.

21 But when you work with this material, it appears -- since it's  
22 mixed so well commercially, it appears to just look silver in  
23 color. You almost can't discern any heterogeneous compounds  
24 within there, like a mixture of different things, until you put  
25 it under a microscope and start looking at it. And then you

1 can see the many different things that go in there. But  
2 working with that, we definitely use gloves, but it's almost  
3 impossible not to get the material coating on your hands, the  
4 silver powder, which is aluminum powder or magnesium powder  
5 which may be in there as well.

6 Q. And if you were to use black powder as if from a  
7 propellant or as a -- or just in bulk form, how clean or dirty  
8 is that to extract and to make into a low-explosive device?

9 A. Black powder is pretty unique because it literally looks  
00:34 10 like very small pieces of coal. It comes in various grain  
11 sizes depending on what application the -- the people that use  
12 it for hunting or black-powder rifles. It has four different  
13 sizes. But they're very highly polished, little, irregularly  
14 shaped lumps of powder material. So if I handle that, I'll get  
15 a little bit of chemical residue on me, but it's not going to  
16 really notice -- or be able to see on my hands, yes, I just  
17 handled black powder because my hands are all black now. It  
18 doesn't work that way. It's coated with graphite to keep the  
19 friction down, so if you're pouring it, it doesn't generate  
00:34 20 friction which could set it off.

21 Q. Now, as part of this investigation, you said that you had  
22 analyzed a number of bulk materials submitted as well as  
23 post-blast materials --

24 A. Yes.

25 Q. -- correct?

1       With regard to the bulk materials submitted, for example,  
2 in that plastic container in Watertown, was there several  
3 pounds of explosives in that container?

4       A. I didn't weigh out the material. It was presented to me  
5 in smaller, couple grams of material to analyze.

6       Q. But to create that bulk material, would you expect to see  
7 residues of that bulk material wherever it was created?

8       A. In that volume and that mass that was produced, yes.

9       Q. And if there was the same type of powder in the pressure  
00:35 10 cooker devices and the pipe bombs, then you would expect that  
11 there would be even more bulk material that would have had to  
12 have been prepared before they could have been used in those  
13 devices?

14       A. Yes.

15       Q. Again, did you, in your investigation, see traces or  
16 evidence that was consistent with a -- the volume of particles  
17 of residue that would indicate where specifically these devices  
18 were assembled?

19       A. No.

00:36 20                   MR. WATKINS: I'm going to object. Very confusing.

21                   THE COURT: Well, in light of the answer, I'll let it  
22 stand.

23       Q. Did you also receive in the lab for analysis trace filters  
24 from various vacuum samples?

25       A. Yes.

1 Q. And did you see -- receive those from various search  
2 locations in the investigation?

3 A. Yes.

4 Q. Was there any one set of trace filters that you received  
5 that indicated that there was a large volume of traces of  
6 either black powder or low-explosive, pyrotechnic mixture?

7 A. I'm going to have to refer to my report. Is that okay?

8 Q. Please, to refresh your recollection.

9 A. So there are going to be specimens Q933, that whole  
00:37 10 sequence from -- let's see here -- 410 Norfolk Street,  
11 Apartment No. 3. So the residues -- so some of the filters  
12 that I analyzed did contain residues of pyrotechnic material.

13 Q. So how much residue was there?

14 A. They contained -- again, we don't quantitate. I don't  
15 know how much residue was there. But there's the perchlorate  
16 ion. There's the nitrate -- elevated nitrates, sulfates,  
17 materials like that.

18 Q. So you don't -- you don't measure from the quantity of  
19 these materials when you do the analysis? You just measure  
00:38 20 whether those materials actually exist?

21 A. Correct, if they're present.

22 Q. Aside from Norfolk Street, were there any other locations  
23 where you tested for residue? I guess the question is whether  
24 you tested for residue in other places.

25 A. There were some gloves that were -- some latex or some

1 type of disposable gloves from a vehicle that contained  
2 residues as well.

3 Q. Was that a Honda CR-V that was parked outside of 410  
4 Norfolk?

5 A. Correct.

6 Q. Again, was that pyrotechnic mixture on the fingertips of  
7 those gloves?

8 A. Yes, consistent with pyrotechnic material.

9 Q. Aside from that, was there anything else?

00:39 10 A. Some of the samples from 410 Norfolk Street. There were  
11 four samples that contained small grains of black powder as  
12 well, not just the residues of the ions, the oxidizers that we  
13 were detecting, but actual physical black powder grains were  
14 identified.

15 Q. Now, in a case involving as much explosives as you --

16 MR. WATKINS: I'm going to object, your Honor.

17 MR. CHAKRAVARTY: I'll ask a new question.

18 Q. In this case, would you expect to have seen more residue?

19 MR. WATKINS: I object.

00:39 20 THE COURT: Sustained, sustained, without foundation.

21 Q. Do you expect to see residue -- residues of the creation  
22 of IEDs or, Improvised Explosive Devices, when they are created  
23 in the course of --

24 A. Correct. In this type of operation, if material is being  
25 extracted from fireworks and then ground up somehow, it's hard

1 to keep a clean surface. It's hard to not contaminate or  
2 spread this material around to the surfaces or areas you're  
3 working in or getting it on your person, yourself, within your  
4 clothes and then tracking it to other areas. It's very  
5 difficult.

6 Q. So is it fair to say that there was at least a large --

7 MR. WATKINS: Objection, your Honor. Leading.

8 THE COURT: No. Overruled. Go ahead.

9 Q. -- an unquantifiable but a substantial amount of explosive  
00:40 10 powder that was necessary to create the devices on Boylston  
11 Street and in Watertown?

12 A. Yes.

13 Q. And did you find the residues that were commensurate with  
14 that volume --

15 MR. WATKINS: I'm going to object, your Honor. Can we  
16 be seen at sidebar?

17 THE COURT: Okay.

18 (SIDEBAR CONFERENCE AS FOLLOWS:

19 MR. WATKINS: He's trying to get into an opinion that  
00:41 20 hasn't been noticed. I'm not exactly sure where he's going in  
21 the long term of the guilt phase here, trying to suggest that  
22 the bombs weren't built in Norfolk or built somewhere else. I  
23 don't know what that has to do really with anything in the  
24 guilt phase. So I'm wondering about relevance on that.

25 I was not noticed about this particular aspect of the

1 testimony where he's really speculating about where -- what Mr.  
2 Chakravarty is trying to do is get a conclusion that the bombs  
3 were not built at Norfolk Street through a series of questions,  
4 "wouldn't you expect." I don't know that he's going to ask  
5 that, but that certainly suggests to the jury. And on that  
6 aspect, really what he's trying to do is elicit an expert  
7 conclusion without soliciting an expert conclusion.

8 MR. CHAKRAVARTY: I'm not trying to elicit an expert  
9 conclusion. I'm doing two things: one is preempting what I  
00:42 10 anticipate to be a line of questioning from the defense. So  
11 I'm simply exposing what his analysis was about those trace  
12 explosives and other things that Mr. Watkins raised yesterday.  
13 So he's exposing that. And in order to provide the context of  
14 what those -- that analysis means, I'm eliciting from him the  
15 fact of the residues that he found there was a relatively small  
16 amount of residue versus the amount of explosives that he had  
17 -- the amount of explosives that appeared to have been  
18 involved. That's precisely the question I'm asking for.  
19 There's no line of questioning.

00:42 20 THE COURT: What about the notice issue? Was this in  
21 his report?

22 MR. CHAKRAVARTY: What's in his report is that there  
23 are trace amounts of the explosives and the residues, and it's  
24 -- what's not in his report is an opinion as to whether the  
25 trace amount would be proportional to the amount of explosives

1 that may have been involved in the case because, frankly, at  
2 the time he did the report, he didn't know what the trace  
3 amount was. I'm not sure that that's an expert opinion.

4 THE COURT: I think it is so I'd exclude it.

5 MR. CHAKRAVARTY: Okay.

6 . . . END OF SIDEBAR CONFERENCE.)

7 MR. CHAKRAVARTY: Your Honor, a moment ago I showed  
8 Mr. McCollam Exhibit 1230-10, and that's part of the 2-D  
9 exhibit and it's in evidence, but it's not separately marked as  
00:44 10 such. So I would move that into evidence.

11 MR. WATKINS: Are we talking about the photograph?

12 MR. CHAKRAVARTY: The photograph.

13 MR. WATKINS: Then no objection.

14 (Government's Exhibit No. 1230-10 received into evidence.)

15 THE COURT: Okay.

16 MR. CHAKRAVARTY: Thank you, Mr. McCollam.

17 CROSS-EXAMINATION BY MR. WATKINS:

18 Q. Good morning, Mr. McCollam.

19 A. Good morning.

00:45 20 Q. Mr. Chakravarty was asking you a series of questions about  
21 other items that you tested in the laboratory for explosive  
22 residues?

23 A. Yes.

24 Q. And there was really a whole lot of items that you  
25 analyzed? You were a very busy man in this case; is that fair

1 to say?

2 A. Yes.

3 Q. And your report is quite lengthy and goes on to identify a  
4 whole host of items that you examined and/or tested for  
5 explosive residues, right?

6 A. That's correct.

7 Q. Showing you what's been admitted as Exhibit 3099 -- I'm  
8 waiting for it to come up.

9 You mentioned in your report a Q number. Exhibit 3099 is  
00:46 10 Q667. Do you see that in your report?

11 A. I do.

12 Q. What was the -- your analysis of exactly what was found on  
13 those gloves in Q667?

14 A. Within some of those gloves there was black smudging on  
15 some of the fingertips. So that smudging in that fingertip  
16 area, I couldn't scrape off any residue, per se, like I could  
17 with the metal fragments that were from the explosions. So I  
18 prepared an SEM slide, or an SEM stub is what it's called. So  
19 I just take the sample holder that's utilizing the SEM  
00:47 20 instrument, and I dabbed it on the fingertip of that glove to  
21 get any residue that's off. That specimen was analyzed on the  
22 SEM. Then I did a water wash of that -- those black-tipped  
23 from the particular gloves that were within Specimen 667 and  
24 668, actually.

25 Q. You told us about ions and anions that you look for when

1 you're doing your analysis?

2 A. Correct.

3 Q. You found those on these -- this set of gloves, right?

4 A. I found some anions, yes.

5 Q. Residues detected carbon, oxygen, iron magnesium. You  
6 explained to us already that those are items that are included  
7 in low explosives?

8 A. They're included in some pyrotechnic formulations. They  
9 can be in some low explosives, but they're commonly found --  
00:48 10 those, in particular, were common for firework material.

11 Q. Actually, those things can be found everywhere in nature,  
12 but the combination starts to suggest fireworks and pyrotechnic  
13 formulations?

14 A. Correct.

15 Q. Going on, silicone, sulfur, calcium, chlorine, potassium,  
16 barium and zinc, those are things also found when you analyzed  
17 these gloves that were found in the Honda CR-V?

18 A. Yes.

19 Q. Again, you analyzed many, many things, and for many of  
00:48 20 them you concluded there was no explosive residue, right, on  
21 many of the items that came into your laboratory?

22 A. Correct.

23 Q. But these certainly were of note because of that  
24 particular collection of elements indicated pyrotechnic  
25 formulations, right?

1 A. Yes.

2 Q. And you mentioned -- you anticipated already 668, the same  
3 thing, another latex glove found in the CR-V. You found the  
4 same kinds of ions and anions on that glove also, correct?

5 A. Yes.

6 Q. And, again, you've analyzed a lot of different things.  
7 And if there were no collection of those elements, you wouldn't  
8 report a finding or you'd report no finding. But certainly  
9 this was of interest given those collection of elements on the  
00:49 10 glove, right?

11 A. Yes.

12 Q. Also, 671, another latex glove found in the CR-V, it was  
13 notable because it had --

14 MR. CHAKRAVARTY: Objection, your Honor. I think this  
15 is the same photo from the -- same glove from a different  
16 angle.

17 MR. WATKINS: Is it? I'm sorry. This is Q671. Maybe  
18 I hit the wrong one before.

19 Q. These are different, aren't they?

00:50 20 MR. CHAKRAVARTY: I stand corrected.

21 Q. 668 and 671?

22 A. Correct, yes.

23 Q. So they're two different gloves. They look very much the  
24 same, right?

25 A. They do, but they have different numbers, Q numbers.

1 Q. Which means they're different items?

2 A. Yes.

3 Q. But there was explosive powder found on each of them? I'm  
4 sorry. "Explosive" is the wrong word. There were elements on  
5 those gloves consistent with pyrotechnic formulations?

6 A. On 667 and 668 but not on 671, that second picture you  
7 showed.

8 Q. Right. 671 found chloride nitrate and sulfate items,  
9 right, according to your report?

00:51 10 A. Yes.

11 Q. That's here, 671. Not as many elements as those other  
12 items but still enough to warrant a finding in your report or  
13 at least a mention in your report, right?

14 A. Yes. I listed chloride, nitrate, and sulfate on those  
15 items.

16 Q. Because those are also consistent with pyrotechnic  
17 formulations and low explosives?

18 A. They can be, yes.

19 Q. In addition to actual items, you received vacuum  
00:52 20 filters --

21 A. Yes.

22 Q. -- to analyze, right?

23 A. Yes.

24 Q. And vacuum filters come from vacuum sweeping? There are  
25 forensic vacuums that the FBI has for this purpose?

1 A. Yes, they're special filters.

2 Q. Special vacuums and special filters and actually written  
3 procedures about how one goes about vacuum-sweeping an area,  
4 right?

5 A. Those -- I'm not aware of those procedures. I'm not an  
6 ERT member, so I didn't collect any of these samples.

7 Q. But you do get those trace filters back to the lab and  
8 that's what you analyze?

9 A. Yes.

00:52 10 Q. There's no picture for it because it's, you know, trace  
11 filter. But Q669 is also a vacuum filter from the Honda CR-V  
12 at 410 Norfolk. Do you see that in your report?

13 A. Yes.

14 Q. Again, you identified that as having residues of chloride,  
15 nitrate, and sulfate, right?

16 A. Yes.

17 Q. Again, consistent with pyrotechnic formulations,  
18 low-explosive residue?

19 A. Some, yes.

00:53 20 Q. Finally, Q732 was a vacuum filter from a sweep of a Honda  
21 Odyssey at 410 Norfolk, the same for that contained residues of  
22 chloride, nitrate, and sulfite, right?

23 A. That's sulfate.

24 Q. Sorry, sulfate.

25 A. Yes.

1 Q. In addition to the items found -- Q667, just to go through  
2 and make it clear for the record, I showed you Exhibit 3099,  
3 which was Q667. I showed you Exhibit 3100, which is Q668. Is  
4 that correct?

5 A. Yes.

6 Q. And then Exhibit 3101, this is a second picture -- not a  
7 second picture -- a picture of a second glove, which was Q671,  
8 is that correct?

9 A. Yes.

00:55 10 Q. Have you also analyzed a set of tools and other items that  
11 were denoted Q725? It was a box of tools and other things that  
12 was admitted yesterday as Exhibit 1094.

13 A. Yes. Q725 I analyzed.

14 Q. I'm sorry?

15 A. Yes. I analyzed Q725.

16 Q. What that involves is a lot of different items that were  
17 found in a drawer at 410 Norfolk?

18 A. Yes.

19 Q. There were two items on that that also included evidence  
00:56 20 of low explosives?

21 A. Yes.

22 MR. WATKINS: Your Honor, I don't think this is in  
23 evidence, so perhaps we can go just to the witness.

24 Q. Showing you a picture of 725.11, is that one of the items  
25 that you analyzed?

1 A. Yes.

2 Q. That is a picture -- do you recognize that as a picture  
3 that you looked at because it was taken in the Quantico  
4 laboratory?

5 A. Yes.

6 MR. WATKINS: I'd seek to admit Exhibit 3102.

7 MR. CHAKRAVARTY: No objection, your Honor. I think  
8 it may also have a government exhibit number.

9 (Defendant's Exhibit No. 3102 received into evidence.)

00:56 10 MR. WATKINS: Is it? There you have it. May we  
11 publish that?

12 THE COURT: Yup.

13 Q. And that -- it's a hobby fuse, right?

14 A. That's one of the names -- common names for it, yes.

15 Q. And there are traces of potassium perchlorate and carbon  
16 on the hobby fuse?

17 A. Not traces. There's actual bulk explosive --  
18 low-explosive material that is contained within the core of  
19 that. You can't see it on the outside, but it's contained with  
00:57 20 the inside of it.

21 Q. I want to direct your attention to Q725.24. Now, there's  
22 not a separate picture of that item, but that would be --

23 THE COURT: Is this in evidence? It's all part of the  
24 interactive anyway, I think. It was shown in that. I don't  
25 know that it was separately marked. Any problem showing it to

1 the jury?

2 MR. CHAKRAVARTY: No, your Honor.

3 THE COURT: Okay.

4 MR. WATKINS: May I have just a moment?

5 Q. Anyway, this picture that's up before you with a red  
6 circle around a lid, did you analyze that black lid?

7 A. I analyzed the lid, yes.

8 Q. I'm sorry. Analyzed the lid with the black residue on it?

9 A. Yes, sir, I did.

00:58 10 Q. And that was notable for high explosives, nitroglycerin,  
11 on it, right?

12 A. Correct. Nitroglycerin is a high explosive.

13 Q. You told us about smokeless powder. These items were  
14 consistent with smokeless powder?

15 A. Right. The residues that I detected on that can lid  
16 contained nitroglycerin and another chemical called ethyl  
17 centralite. Those two chemicals are commonly found in some  
18 smokeless powder formulations. It will be a double-based  
19 smokeless powder.

00:59 20 Q. Again, I'm told this picture was introduced as Exhibit  
21 3066 yesterday. This picture is in evidence. And it is a  
22 collection of items that you understand through your notes was  
23 collected at 410 Norfolk, in a drawer, right?

24 A. Correct.

25 Q. You received vacuum filters for analysis sometime in July

1 or August of 2013? I would be referring to Q1283 through 1293.

2 A. Yes.

3 Q. When did you receive those items?

4 A. I don't recall the exact date that I received them, but  
5 they came into the laboratory -- because when evidence comes  
6 into the laboratory, it's assigned a unique identifying number.  
7 It appears that those came in August 16, 2013.

8 Q. And these were more vacuum filters, right, for analysis?

9 A. Q1283 through Q1291 were vacuum filters. Q1292 was a vent  
01:01 10 filter. And then I believe you said 1293 -- you said Q1293  
11 were swabs.

12 Q. In your report, you have those identified with particular  
13 locations where they were from, that they had been collected  
14 from?

15 A. When the evidence is inventoried within the laboratory,  
16 they just have a disclaimer stating where these items were  
17 collected from. I don't know where they're collected from  
18 other than what somebody tells me.

19 Q. Right. What were you told that -- where they were  
01:01 20 collected from?

21 MR. CHAKRAVARTY: Objection, your Honor.

22 THE COURT: Overruled.

23 MR. WATKINS: Sorry?

24 THE COURT: Overruled. You may have it.

25 A. The following items were recovered from UMass Dartmouth,

1 Pine Dale Hall, Room 7341, North Dartmouth, Massachusetts, by  
2 FBI Boston.

3 Q. So, again, these are vacuum filter traces consistent with  
4 the kinds of evidence you would get if somebody had vacuumed up  
5 an area and sent it to you for analysis?

6 A. Yes.

7 Q. And you analyzed all of those vacuum filters?

8 A. Yes.

9 Q. Did you find any of the traces that you talked about with  
01:02 10 the jury as being indicative of pyrotechnics?

11 A. No. The screening technique showed that they were  
12 negative for any typical explosive residue traces that we  
13 screen for.

14 MR. WATKINS: That's all I have, your Honor.

15 MR. CHAKRAVARTY: Very briefly, your Honor.

16 REDIRECT EXAMINATION BY MR. CHAKRAVARTY:

17 Q. Mr. McCollam, you testified that there may have been  
18 pounds of low explosives that were used in this case?

19 A. Correct.

01:03 20 Q. And you testified that it's an extremely messy process to  
21 create those low explosives?

22 A. Yes.

23 Q. And as far as you know, with regards to the trace amounts  
24 of low explosives that Mr. Watkins asked you about, you found  
25 them on some gloves, and you found some in some vacuum filters

1 from 410 Norfolk Street?

2 A. Yes.

3 Q. And that's the only trace amounts that you found in this  
4 case; is that fair to say?

5 A. Yes.

6 Q. And unlike trace amounts of explosive product, there was  
7 actually intact fireworks found in the dorm room in Pine Dale  
8 Hall, isn't that right?

9 A. If it was submitted to the laboratory coming from there, I  
01:04 10 analyzed it, so, yes, there were.

11 Q. And in the landfill, there was a bag containing intact  
12 amounts of low-explosive, pyrotechnic mixture?

13 A. Yes.

14 Q. Did you ever find a location, a single location, where  
15 there was a production facility for these IEDs?

16 MR. WATKINS: Objection, your Honor.

17 THE COURT: Sustained.

18 MR. CHAKRAVARTY: That's all I have, your Honor.

19 THE COURT: Anything else?

01:04 20 All right, sir. Thank you. You may step down.

21 MR. CHAKRAVARTY: The government calls Edward Knapp.

22 THE CLERK: Sir, want to step up here, please. Step  
23 up to the box. Remain standing. Raise your right hand.

24 EDWARD S. KNAPP, Sworn

25 THE CLERK: Have a seat. State your name. Spell your

1 last name for the record. Keep your voice up and speak into  
2 the mic so everyone can hear you.

3 THE WITNESS: Edward S. Knapp, K-n-a-p-p.

4 DIRECT EXAMINATION BY MR. CHAKRAVARTY:

5 Q. Morning, Agent Knapp. Are you a supervisory special agent  
6 with the FBI?

7 A. Yes, I am.

8 Q. How long have you been with the FBI?

9 A. Over 19 years.

01:05 10 Q. Before the FBI, what did you do?

11 A. I was in the United States Navy.

12 Q. How long were you in the United States Navy?

13 A. A little over eight years.

14 Q. What unit were you in in the United States Navy?

15 A. I was Naval Special Warfare, and that was -- basically  
16 that's Navy SEAL.

17 Q. Before that, what did you do?

18 A. I went to college and graduated from the United States  
19 Naval Academy.

01:06 20 Q. As long as you've been an agent, have you had a variety of  
21 different duties?

22 A. Yes, I have.

23 Q. And can you just give the jury an overview of your career?

24 A. I was afforded regular basic FBI agent training. Then I  
25 went down to the Miami Field Division. I investigated violent

1       crime, kidnapping, extortions. At the same time, I got to go  
2       to bomb technician school through the FBI in Huntsville,  
3       Alabama, where all state and local bomb technicians are  
4       trained. And I was afforded that opportunity. And I went back  
5       to Miami. Then I went and applied for a position up in the FBI  
6       laboratory where I currently reside since the late 2003.

7       Q. So let's -- at one point you were a -- I don't want to say  
8       "regular" special agent because it doesn't make sense. But you  
9       were --

01:07 10      A. Special agent.

11     Q. You were a special agent. Then you specialized in -- as  
12       being a bomb tech, a special agent bomb tech?

13     A. Yeah, that's correct.

14     Q. So can you describe the process to become a special agent  
15       bomb tech?

16     A. Well, it was a course, a six-week course, basically how to  
17       become a bomb tech, things of -- as far as explosives, handling  
18       explosives, circuitry, what are bombs made up of, training  
19       basic to render safe RSP bombs, how to deal with that.

01:07 20      Q. RSP, does that stand --

21     A. Render Safe Procedure, to neutralize an IED or a bomb.

22     Q. Are there a variety of field divisions that have special  
23       agent bomb techs?

24     A. Yes. All 56 field divisions have a bomb technician.

25     Q. What are the duties of a special agent bomb technician?

1 A. They basically coordinate. They liaise state and local,  
2 assist them at times for special events or if there's  
3 call-outs.

4 Q. What kind of activities do you do if there's a call-out?

5 A. I might respond with that particular bomb unit to a call.  
6 Things are reported back through them to our FBI headquarters  
7 notifying that there's an incident going on.

8 Q. And those incidents amount from, like, suspicious packages  
9 all the way to an explosion, is that right?

01:09 10 A. Correct.

11 Q. And when you respond, do you do a variety of evidence  
12 collection techniques?

13 A. I imagine they do. I mean, at this point that's up to --  
14 in that field division, what's going on there at that time.

15 Q. Just describing your -- when you were an SABT, did you go  
16 out and respond to scenes? And describe some of the things  
17 that you did.

18 A. If, yeah, there was a scene or go -- suspicious package or  
19 there's some material that looks like maybe explosives or hand  
01:09 20 grenade or might be explosive material, to assess if it's a  
21 hoax or not.

22 Q. And then did you also do render safe procedures?

23 A. Practiced a lot. But, I mean, I ended up leaving there  
24 after a year or two to come up to the FBI laboratory.

25 Q. You mentioned earlier that you attended the Huntsville

1 bomb tech training course. Can you explain what that is?

2 A. That's a six-week process. You're familiar with  
3 electrical and nonelectric fusing systems to detonate  
4 explosives. You handle explosives. You look at render-safe  
5 tools, tools that are used to disrupt IEDs, X-ray  
6 interpretation, things like that. And you have training and  
7 then scenarios. And you get qualified after that if you pass  
8 tests and meet the standards.

9 Q. And who is administering these tests and standards?

01:10 10 A. That's the Hazards Device School, and it's run by the FBI.  
11 And there's -- there was military bomb techs or retired  
12 military bomb techs, you know, retired or public safety bomb  
13 techs that are assigned as instructors down there in that  
14 school.

15 Q. And they evaluate you before they qualify you?

16 A. Yeah. There's practical application scenarios, getting in  
17 the bomb suit, taking a disrupter, and neutralizing an IED.

18 Q. As a result of that, do you get certified as a hazardous  
19 device technician?

01:11 20 A. No.

21 Q. Okay. How does that happen?

22 A. That's a bomb technician.

23 Q. Bomb technician, excuse me. Is there a certification for  
24 that?

25 A. For?

1 Q. For a bomb technician.

2 A. That is the -- down in Huntsville, Alabama.

3 Q. Is there ongoing training or a way to assess whether your  
4 skills are up to date?

5 A. There's periodic IED training with state and locals. That  
6 all depends, like I said, on the division where you're at and  
7 the bomb techs with their state and local counterparts.

8 Q. Have you continued to do that since this training?

9 A. No. I'm in the FBI laboratory, in the Explosives Unit.

01:12 10 Q. I'm just trying to get a sense of, after your training,  
11 how long you were in the field doing this work and then before  
12 you came to the FBI lab.

13 A. It was about a year and a half.

14 Q. And during that time, did you investigate explosives  
15 incidents?

16 A. It's been awhile, but there's one or two, you know, and  
17 then doing special events with the state and locals over down  
18 in Florida where I was assigned. But, you know, it's been  
19 awhile but one or two times at some call-outs at night, but  
01:12 20 other than that --

21 Q. So the bulk of your experience has been at the FBI  
22 laboratory?

23 A. I had to be trained and certified, yes.

24 Q. So please explain that.

25 A. There's a process. I'm a hazardous device examiner in the

1       FBI, and we fall under the TEDAC section under the FBI  
2 laboratory. And we have --

3       Q.     Let me pause there. What is TEDAC?

4       A.     The acronym is Terrorist Explosive Device Analytical  
5 Center. But in the course of -- in the Explosives Unit,  
6 there's training that basically I had to complete. It takes  
7 several years. There's actually working cases, doing oral  
8 examinations, explosives, the admin oral boards for as far as  
9 the FBI laboratory protocols and procedures and how evidence is  
01:13 10 handled and sent through our laboratory besides working cases  
11 with a qualified examiner and then also outside training that  
12 was afforded along with -- actually, they would test --  
13 basically test us. Basically we would -- you know, a case -- a  
14 mock case would come in. We would have to go from start to  
15 finish. Then we'd have to basically write reports and then  
16 testify in a mock room setting. You had to complete so many  
17 cycles of that type of training. And then once you completed  
18 all that training, if you completed it, then you would be  
19 certified as a hazardous device examiner.

01:14 20      Q.     So can you explain to the jury the difference between a  
21 bomb tech and a hazardous device examiner?

22      A.     Well, we had additional training outside, going to  
23 commercial explosive manufacturers, military manufacturers. We  
24 have liaison with those type industry reps. We had basically a  
25 little more extensive training as to be an examiner, you know.

1 Bomb tech, you know, they render safe some type of device and,  
2 you know, it's sent to us. And we're trying to put the pieces  
3 back together and try to figure out the functionality of this.  
4 Was it actually a device or was it not or what they call a hoax  
5 device.

6 Q. So you examine evidence that's submitted from the field?

7 A. Yes.

8 Q. I jumped the gun earlier to say -- when I asked whether  
9 you had been certified to do that. Have you been?

01:15 10 A. Yes.

11 Q. When -- for how long have you been a certified hazardous  
12 device examiner?

13 A. Since approximately 2007.

14 Q. In the course of the last eight years, have you had  
15 occasions to conduct not just the mock hazardous device exams  
16 but actual real cases of hazardous device exams?

17 A. Yes, I have.

18 Q. About how many do you think you've participated in?

19 A. Dozens.

01:16 20 Q. And have you had training in this last eight years as well  
21 after you have been certified?

22 A. Yes.

23 Q. Can you describe -- you described some of it.

24 A. I mean, each year you have to go through a proficiency  
25 testing to make sure you're still qualified, and you have to

1 pass those testing.

2 Q. And is that administered by others in your field who are  
3 also hazardous device --

4 A. It's a requirement in the FBI laboratory under the -- as a  
5 forensic laboratory under ASCLD.

6 Q. And the process of conducting a forensic exam, is that a  
7 collaborative process that you have -- you do with a team and  
8 various disciplines?

9 A. Well, as far as when the case comes to me, it's checked  
01:16 10 in. It comes to us. There's a process of checking it in. I  
11 mean, I have a technician that is assigned to me. And this is  
12 checked in. We then go to send the evidence out to other  
13 forensic disciplines within the lab, DNA, latent fingerprints,  
14 question documents, trace evidence, firearm toolmarks. So this  
15 evidence is then being sent to the other disciplines for them  
16 to work on their discipline to find DNA or latent prints. And  
17 it would be transferred with the proper protocols through the  
18 different disciplines, and it would come back to us. But at  
19 the end, at the end point, I'm looking and analyzing the  
01:17 20 material that had come in to me on a case and whatever field  
21 division in the FBI.

22 Q. Then you render your assessments about that evidence?

23 A. Well, whether it is an IED or a bomb, a homemade bomb, or  
24 it's not. It could be a hoax bomb. Yes.

25 Q. And in many of the cases that you've examined, have items

1 been submitted to you that hadn't exploded?

2 A. Sometimes, yes.

3 Q. And in other cases, there are so-called post-blast  
4 investigations; you get the remnants of materials?

5 A. Yes, that's correct.

6 Q. In addition to Improvised Explosive Devices, have you had  
7 training in other types of explosive devices?

8 A. I mean, when you talk about an Improvised Explosive  
9 Device, it can be commercially available, military available  
01:18 10 materials or commonly, readily available you can find and buy.

11 And it's just form fashion as the term is "improvised."

12 Sometimes we get an actual -- could be some military munitions,  
13 and we have to deal with that, you know. But normally they  
14 come in and they're improvised somehow, not designed as they  
15 were meant to be functioned.

16 Q. Can you elaborate on that? Improvised Explosive Device, I  
17 think we understand what those words mean by themselves. But  
18 can you explain --

19 A. In an Improvised Explosive Device, you have to have two  
01:19 20 things. You have to have a main charge, some type of  
21 explosives, and some type of fusing system. It could be an  
22 electrical fusing system or nonelectrical fusing system. Those  
23 are the two main components. And then sometimes how -- what  
24 explosive you use, whether it's a high explosive, like a  
25 military grade, or a low explosive, like a powder, you might

1 need a container to use in a low-explosive device.

2 Q. Is that because the gases that build up is what causes the  
3 explosion in a low-explosive explosion?

4 A. Yeah. You have to have some type of confinement. And  
5 basically the chemical reaction in it relieves it mechanically,  
6 and there's an explosion in that container.

7 Q. Okay. So as a hazardous device examiner, how do you go  
8 about conducting a post-blast evidence forensic examination?

9 A. Well, when the material comes in, you know, it's just a  
01:20 10 bunch of, you know, bits and pieces, and we're trying to  
11 segregate out stuff that's -- you know, it's not part of the  
12 bomb or what I'm looking for, an IED, and then trying to start  
13 to recognize pieces of maybe parts of the bomb, whether the  
14 fusing system, depending on what type it is, if there's a  
15 container. There might be a concealment container. Then  
16 you're basically trying to identify, I have a power source, or,  
17 yes, here's a switch, all kinds of, you know, ways someone  
18 could fashion a bomb so --

19 And then we're trying to determine the functionality of  
01:21 20 the bomb. And then sometimes there's also -- something might  
21 have happened in one scene, and then there's a search at  
22 another scene, and they might collect some evidence. And then  
23 they might ask -- this is the field division or the people  
24 request an exam that maybe we compare items from a search scene  
25 and from the bombing scene.

1 Q. And so when you assemble the evidence and you're trying to  
2 figure out what parts are what, how do you go about it? Do you  
3 take measurements? Do you take pictures? What are you looking  
4 at?

5 A. We're looking at roughly trying to separate, like I said  
6 before, you know, electrical fusing system needs certain  
7 components in it, and we're trying to look for those. An  
8 electrical fusing system, you can have some sort of power  
9 source. It could be varied type of battery. You have to have  
01:22 10 a conductor, some wire. You would have to have some type of  
11 switch or switches in combination. And also, at the end, we  
12 call a load or the -- where the detonator or refer to, like, a  
13 blasting cap, or it could be an improvised detonator or  
14 initiator.

15 So you're looking through all the material, and you're  
16 trying to find if there is a viable fusing system in there and  
17 also then separating out, if there was a container used, the  
18 pieces that are coming together, all these little pieces.  
19 There might have been sometimes fragmentation that was added,  
01:22 20 you know, into a device or there's a container or it was  
21 transported in a box or, you know, some other means. Then  
22 there might be little bits and pieces left at the scene there.  
23 But you're going -- concentrating on that to figure out. And  
24 also, you know, things are being sent to our explosive chemist  
25 for testing to try to see what type of explosive material was

1 used.

2 Q. Okay. You just mentioned several things there. Are each  
3 of those different systems, different components of an IED, a  
4 fusing system, a container, and an explosive main charge?

5 A. Yeah, that's correct.

6 Q. Is an energy source also necessary for that?

7 A. A power source.

8 Q. A power source. For an electrical system, it would be a  
9 power source?

01:23 10 A. Some type of power source.

11 Q. For something like a pipe bomb, what would the energy be  
12 from?

13 A. It just depends on how it's made. It could be a simple,  
14 like, a firecracker fuse or those green -- that hobby fuse,  
15 what we call, just lighting that with a match, or it could be  
16 an improvised initiator and you're using a battery with some  
17 type of switch to complete the circuit, and you could function  
18 it that way.

19 Q. Okay. With regards to each of these components, the  
01:24 20 energy source, the fusing system, a main charge or a container,  
21 can you give some examples of each of those that you've seen  
22 before or you've read about?

23 A. Well, I mean, for an energy power source, nine-volt  
24 batteries, six-volt lantern batteries, car batteries, things  
25 like that. I mean, I've seen regular commercial blasting caps,

1 commercial nonelectric blasting caps that were improvised to  
2 make them electric blasting caps, blasting caps that were  
3 improvised and made, initiators that were -- could be from an  
4 SD rocket ignitor used as an initiator.

5 Q. How about the various different vessels or containers that  
6 you've seen?

7 A. Pipes, pressure cookers, I've seen those; pipes; in a box;  
8 PCV pipe.

9 Q. Can you describe for the jury how these various components  
01:25 10 interact together to create an IED?

11 A. If we're talking in this -- in general or --

12 Q. In general, and then we'll move to this case.

13 A. In general, I mean, if you have that low explosive, you're  
14 going to have to have a container. And then it depends. It's  
15 as simple as putting a hobby fuse in it and lighting the hobby  
16 fuse or, like I said before, you had some improvised initiator,  
17 and you have to have a power source attached to it and then  
18 some type of switch that will close that circuit and send a  
19 current to that improvised initiator to ignite the low  
01:26 20 explosive.

21 Q. And then, because of the containment of the low explosive,  
22 it will explode?

23 A. If that's what the -- yeah, main charge was, yes.

24 Q. Now, for purposes of this case, were you assigned to lead  
25 the forensic examination of the explosives?

1 A. Yes, for the Explosives Unit, yes.

2 Q. So can you explain what you did early on in the  
3 investigation?

4 A. It started that next day. Evidence started flowing into  
5 the laboratory. And as far as it was coming in, it was being  
6 checked in, our process of checking it in, photographing it,  
7 documentation, setting up an exam plan for all the other  
8 disciplines. And it just -- it kept coming in every about 12  
9 hours. There was a shipment at night, shipment in the morning.  
01:27 10 And technicians were receiving the evidence in. We were  
11 looking -- looking at it. Sometimes it was sent -- some of the  
12 material was sent over maybe to DNA, if there was an issue,  
13 they wanted to get DNA or latents. But all these examiners,  
14 material was going to them. And then it was coming back to us  
15 to -- to our unit but specifically me to analyze and start  
16 looking through this.

17 I mean, there was over 1,300 submissions. There might  
18 have been 1,300 submissions, but it wasn't one single item.  
19 We're talking hundreds. So there was probably thousands of  
01:27 20 little bits and pieces of trying to go look through this stuff,  
21 all this material. And you started separating and then started  
22 recognizing, you know, what I talked before about, if there was  
23 a piece of a battery, a piece of some type of switch. Then you  
24 started getting through the material that was just, you know,  
25 collected up at that scene.

1       What I was specifically looking for, you know, what type  
2 of -- if there was a container, if there was some type of  
3 fusing system. And what I started to find, that there was a  
4 container or, like, a backpack. Then there was pieces of  
5 metal, larger pieces of metal that was the container, with the  
6 bomb -- you know, it was contained, like, because then found  
7 there was a low explosive in it. Then we started seeing bits  
8 of wire and pieces of electronic or R/C model -- hobby model  
9 components within and amongst the debris. And that all started  
01:28 10 coming in and started separating out, looking for what you need  
11 for that electrical fusing system and started putting back the  
12 pieces. And then we went on to look at it and test the  
13 functionality, if this would work.

14 Q. Okay. So once you get the pieces, you analyze them. You  
15 figure out how they interact with each other?

16 A. We started to figure out what those pieces -- those  
17 components were from. You know, in our unit, we also will do  
18 testing if we need. Sometimes things come in and we'll test it  
19 on the explosives range, but we'll try to re-create the actual  
01:29 20 device. We knew the type of receivers, the electronic -- there  
21 was electronic speed controllers in there from model cars. The  
22 type of model R/C car, we were purchasing some. We started  
23 seeing, like, bits of the container, the Fagor container, the  
24 pressure cooker.

25       We started going out there and looking and purchasing for

1 exemplars because then we'd even take that, and we'd break  
2 apart, say, the R/C component because, in the explosive event,  
3 it's not going to look the same. Some of it, there was bits of  
4 capacitors and bits of a circuit. We actually had an exemplar.  
5 We were taking a look because we'd find tiny pieces of wire,  
6 tiny pieces of the connectors from the chaotic event, from that  
7 explosion. So we also did that for purchasing.

8 And then eventually it came down we put the functionality,  
9 the fusing system together, and did some testing. Then, of  
01:30 10 course, on -- out there in the public domain, the internet and  
11 the manuals for those particular type of R/C transmitter, the  
12 transmitters for the radio cars, also the receiver types for  
13 their -- looking at those and seeing their compatibility and so  
14 forth and doing some testing with that.

15 Q. After you determined what the evidence submitted was, then  
16 you went out and you tried to buy each of these things as  
17 exemplars, intact things?

18 A. Correct.

19 Q. Then you'd use those to figure out exactly how they  
01:31 20 interacted?

21 A. That's correct.

22 Q. Is that customary in your field, to try to purchase  
23 exemplars and then create mock-ups?

24 A. Yes, it is. Even if there was a vehicle that was in an  
25 explosion, to go take -- go to the manufacturer, look at the

1 vehicle, what type of wiring, what type of systems, if it was a  
2 device that was blown up in a car. But, yes.

3 Q. Just before we move on to specifically how you  
4 reconstructed those, did you arrive at a conclusion as to what  
5 exploded on Boylston Street on April 15, 2013?

6 A. Yeah. There were two devices in pressure cookers, two  
7 bombs that were carried in there in backpacks, and they were  
8 pressure cookers. They had electrical fusing system that was  
9 an R/C model hobby car components in it, and there was a low  
01:32 10 explosive in it. And they were placed on -- down in those  
11 areas where they went off.

12 Q. And a few days later, there were some explosions in  
13 Watertown, on April 19th. Did you arrive at conclusions as to  
14 what exploded there?

15 A. Yeah. There was another pressure cooker, a smaller Fagor  
16 pressure cooker. It was -- they recovered, we talked before,  
17 two pipe bombs. There was an elbow and a pipe coupler. But  
18 they had internal end plugs, and they had what I talked before,  
19 just simple hobby fuse. And also there was some fragmentation  
01:33 20 recovered that came in that were bits of pipe and end caps that  
21 had exploded.

22 Q. And in addition to the exploded materials, were there also  
23 intact submissions that you saw?

24 A. That's correct. And there was also approximately three  
25 pounds of a low explosive in a container with hobby fuse coming

1 out of it and also with this green hobby fuse inside the  
2 container, too.

3 Q. Was that also an IED?

4 A. Yes, that is.

5 Q. You may have mentioned that there were a couple of pipe  
6 bombs that had been rendered safe. Did you examine those as  
7 well?

8 A. Yes. And they had some fragmentation on the inside of  
9 them.

01:34 10 Q. Now, are all these Improvised Explosive Devices or  
11 destructive devices?

12 A. Yes. They're a bomb.

13 Q. And so when bombs go off, do you do your own reenactments  
14 of those devices?

15 A. At times. It depends for the explosive effect. But there  
16 was no need for that. I mean, there was widely available that  
17 two devices functioned.

18 Q. So let's move on to some of the evidence collection and  
19 some of the evidence that you looked at.

01:34 20 MR. CHAKRAVARTY: If we could call up Exhibit 620.  
21 This is the 2-D. This is in evidence, your Honor.

22 Q. Agent Knapp, have you seen this interactive exhibit  
23 before?

24 A. Yes.

25 Q. So as far as -- sorry about that. As far as your

1 analysis, what does this -- this is -- I've focused on Scene A.  
2 What was significant to your analysis in terms of what evidence  
3 that you were looking at?

4 A. Well, I mean, this gives a pretty good description of  
5 where the blast seat was and then where the pattern of some of  
6 the materials radiated out from 360 degrees.

7 Q. You said the word blast "seat." Is that where the blast  
8 originated essentially?

9 A. Wherever that device was placed. You can see where it --  
01:35 10 it radiates out. This is a good representation.

11 Q. There's different colors. Do each of these depict  
12 different types of the systems that you had mentioned earlier,  
13 like --

14 A. Yeah, correct, you know, where some of the backpack, some  
15 of the container, the actual pressure cooker, and then there  
16 was also in the -- in this scene, there was copper -- there was  
17 BBs for added fragmentation in there and also where the fusing  
18 system -- you know, pieces happened to land at.

19 Q. Okay. You mentioned "fragmentation."

01:36 20 A. Correct.

21 Q. Can you explain what fragmentation is?

22 A. In terms of -- fragmentation could be primary or secondary  
23 fragmentation. Primary fragmentation would be, like, in an  
24 military ordinance, the casing. When it explodes, that's  
25 primary fragmentation. You might have secondary, which

1 basically, depending on the violence and the pressures built  
2 and as far as that pressure wave going, it picks up pieces in  
3 the surrounding environment and hurls them out -- hurls them  
4 out in all directions. And secondary fragmentation can pick up  
5 just from the scene or sometimes what they call shrapnel or  
6 added fragmentation, where someone places something on a bomb  
7 to try to cause more damage. Usually, you see that, what they  
8 call anti-personnel type devices, where you're trying to cause  
9 as much damage or inflict, maim, kill, or injure personnel.

01:37 10 Q. Now, in terms of how an Improvised Explosive Device works,  
11 if there's no fragmentation, how does that -- how does a bomb  
12 actually injure people?

13 A. Well, there's always -- I mean, there's a bare charge,  
14 but, normally, there's the overpressure and the extreme  
15 pressures going out imparted on the surrounding area, you know,  
16 picks up fragmentation from the surrounding. But it's usually,  
17 you know, overpressure from -- if there's no fragmentation,  
18 it's really the overpressure that's coming to hit an individual  
19 and can cause significant damage and death.

01:38 20 Q. Is that like the shockwave that comes out of the  
21 explosion?

22 A. Yes.

23 Q. Is there also heat sometimes generated?

24 A. Well, there's the thermal effect. If you're close enough  
25 to the -- what particular material there is, you know, the

1 fragmentation, but is a big one, and then basically the  
2 pressure, the overpressure, from -- imparted onto the  
3 surrounding is a big one.

4 Q. All right. So back to the Scene A device, when you  
5 started examining the evidence collected at Scene A, where did  
6 you first start in order to try to reassemble what the  
7 architecture of that device looked like?

8 A. I mean, there was just evidence coming in. It was not  
9 like it all came in from Scene A. There was stuff coming from  
01:39 10 the Medical Examiner's Office, Scene A, Scene B. And we  
11 basically then started piecing it together and seeing -- I'd  
12 see the power -- like I talked before, the fusing system of  
13 this one particular on Scene A was a particular one. And then  
14 on Scene B, the fusing system, the power source was  
15 particularly another -- another type.

16 Q. I see. For each scene there was a different -- your  
17 examination started with a different component based on what  
18 was either unique or the evidence that you found?

19 A. It just came into the lab; and as it came into the lab, a  
01:39 20 process of examining it. It would come back to us. And  
21 basically I knew these particular items were from Scene A.  
22 These particular items were from Scene B. And then you started  
23 analyzing those particular items, looking through the paint  
24 cans with all the material in it, looking through the bags that  
25 came in with numerous things and material inside those. Then

1 you started -- what I talked about is start looking for the  
2 particular components in the fusing system, the container, and  
3 the bag.

4 Q. So let's go to Scene A and explain what you found that was  
5 significant about the device at Scene A.

6 A. On this scene we found the power source. We found the  
7 receiver, the electronic speed controller, also a little part  
8 of the improvised initiator in there, the container. There was  
9 fragmentation and then the bag that was -- that it carried --  
01:40 10 that it was carried in.

11 Q. Now, before I go to the components, I just wanted to show  
12 you a photograph. With regard to the explosion -- you had just  
13 described how an explosion works regardless of the  
14 fragmentation. You described the shock and you described the  
15 fire.

16 MR. CHAKRAVARTY: I'm putting up on the ELMO for the  
17 witness, your Honor, what I'm going to mark now as Exhibit  
18 1573.

19 Q. You see the cloud of smoke and the flames off to the  
01:41 20 right?

21 A. Yes.

22 Q. Is that an accurate description of what an explosion of an  
23 IED would look like?

24 MR. WATKINS: Your Honor, I'm going to object at this  
25 point for a couple of reasons. This exhibit was only provided

1 last night. We actually thought it was coming in through a  
2 different witness. I don't know whether there's been a  
3 foundation for this laid with this witness.

4 THE COURT: All right. Both objections are overruled.  
5 He may answer the question.

6 A. I mean, this is class -- like, in a detonation or  
7 explosion, depending what type of explosive it is. You see the  
8 thermal effect usually close to the seat of the explosion, and  
9 then pressures are radiating out and also fragmentation. I  
01:42 10 mean, we -- besides being an examiner, we instruct and teach  
11 post-blast investigation. And we show students the different  
12 effects of explosives and what happens when they go off,  
13 different type of explosives. So this is just common. That's  
14 an explosion with the thermal effect, which is usually close to  
15 the -- in the seat of the explosion.

16 MR. CHAKRAVARTY: I know it's being published, your  
17 Honor. I don't know if I actually moved it in yet, but I do  
18 move it in.

19 THE COURT: What's the number?

01:43 20 MR. CHAKRAVARTY: 1573.

21 (Government's Exhibit No. 1573 received into evidence.)

22 MR. CHAKRAVARTY: Go back to the computer, please.

23 THE COURT: Actually, we're just about at 11:00. Why  
24 don't we take this opportunity to take the morning recess.

25 MR. CHAKRAVARTY: Thank you.

1                   THE CLERK: All rise for the Court and jury. The  
2 Court will take the morning recess.

3                   (Recess taken at 10:57 a.m.)

4                   (After the recess:)

5                   THE CLERK: All rise for the Court and the jury.

6                   (The Court and jury enter the courtroom at 11:26 a.m.)

7                   THE CLERK: Be seated.

8                   THE COURT: Proceed.

9                   MR. CHAKRAVARTY: Thank you, your Honor.

02:12 10 BY MR. CHAKRAVARTY:

11 Q. Agent Knapp, when we broke we were just getting ready to  
12 look at some of the evidence that was collected at Scene A.

13                  Did you find some evidence related to the fusing system of  
14 the device that exploded at Scene A?

15 A. Yes.

16                  MR. CHAKRAVARTY: Calling up on 620.

17 Q. Is this one of those items?

18 A. Yeah, it's the remains of the electronic speed controller.

19 Q. What is an electronic speed controller?

02:13 20 A. In the model car, it basically sends the power to the  
21 motor, whether it makes it go faster or slower or reverse or  
22 forward, in the model car.

23 Q. And so what function does that perform in an improvised  
24 explosive device?

25 A. It's just basically a switch in the fusing system. And

1 you can see one of the outputs. That hooks up -- the small  
2 leads there hook up to the receiver, and that larger red, you  
3 know, that hooks up to the power source battery, and then  
4 there's -- there should be -- well, it's so damaged. But in  
5 the exemplar there's two leads that go to the output of the  
6 motor, and that's where I found that the improvised detonator  
7 was hooked up to those two outputs that would normally go into  
8 the motor of the R/C car.

9 Q. I'm sorry. Just "R/C car," do you mean a  
02:14 10 remote-controlled --

11 A. Remote-controlled, the hobby car.

12 Q. And the screen in front of you, Agent Knapp -- actually,  
13 if you touch it, it will leave a mark. So if you want to  
14 circle something or show the jury what you're talking about,  
15 you can just touch that area or draw a circle around it.

16 So, now, you described that in the piece of evidence that  
17 you found, some of the components had been burned off or  
18 otherwise destroyed, but in the exemplar, you're able to make  
19 out further definition of what this particular item is?

02:14 20 A. Yes. This is damaged. And in the exemplar, pristine  
21 condition, you can see where the different connections to the  
22 battery, to the receiver, and then to where the -- you would  
23 hook it up to the motor of the hobby car.

24 Q. And is this part of the circuit board to that electronic  
25 speed controller?

1 A. Yes.

2 Q. Is this the lab photo?

3 A. That's correct.

4 Q. And what is this last photo?

5 A. That's the photo of the two leads that come off that  
6 electronic speed controller.

7 Q. You mentioned that they come off and they go to the  
8 detonator?

9 A. Well, in normal configuration that goes to the motor, but  
02:15 10 the two outputs that go to the motor would be connected with  
11 the improvised initiator.

12 Q. What's an initiator?

13 A. Something to set off the main charge, like I talked  
14 before, blasting cap, an improvised blasting cap, or some type  
15 of improvised initiator that would set that main charge off.

16 Q. And what was the initiator in the two devices on Boylston  
17 Street?

18 A. Well, on one, Scene A, there was just a small  
19 fragmentation of a Christmas tree -- basically the green  
02:16 20 Christmas tree lightbulbs that are strung out in like 50- or  
21 200-strand for decoration purposes. And the other scene  
22 nothing was found, but that's not to be expected.

23 Because the violent nature, the reaction, sometimes you  
24 just don't find it remaining or left.

25 Q. Do you recognize what this is?

1 A. Yeah, those are just -- like I said, it had a lot of that,  
2 the fragmentation there, the bits and pieces. And there's part  
3 of a -- that circular thing was part of one of the batteries,  
4 this area -- you know, part of that there was the, you know,  
5 part of the Christmas tree bulb.

6 Q. The Christmas tree lightbulb?

7 A. Yes.

8 Q. And does a Christmas tree lightbulb have enough power to  
9 set off a low-explosive charge?

02:17 10 A. Yes.

11 Q. Did you find other items related to the energy or the  
12 power for that fusing system?

13 A. Yes. The power source, they were Sub-C-size batteries,  
14 but some of that was still connected to part of the leads of  
15 the battery and other parts of the cells were disbursed amongst  
16 the scene.

17 Q. And I'm showing what's marked as Q208. What's that?

18 A. Yeah, I think that was the -- that's the casing of an  
19 Exceed R/C battery. That was 7.2 volts, and that, I think, was  
02:18 20 1800-milliamp rated.

21 Q. And so what was the -- explain how the battery interacted  
22 with that --

23 A. Well, the battery is the -- you know, it basically powers,  
24 you know, the motor of an R/C car. But the battery, that was  
25 the power source to provide current to the improvised initiator

1 and also provided power to the electronic speed controller and  
2 also the R -- the receiver, the small receiver, that was found  
3 also at the scene.

4 Q. Let's go to that. I'm showing you what's marked Q178, a  
5 photo of Q178. What is that?

6 A. That was the remains of the Flysky receiver.

7 Q. When you say "Flysky," is that the name brand of the  
8 receiver?

9 A. 245 was the model, yeah, the brand of the receiver.

02:19 10 Q. So can you explain what a Flysky receiver is?

11 A. A Flysky receiver basically receives a signal from the  
12 transmitter. In a normal R/C, the model hobby car, you'll have  
13 a transmitter or controller, what you steer or drive the car  
14 forward or reverse. The receiver is in the model car. You  
15 have the electronic speed controller in there that deals with  
16 the motor once you hook those leads up. And then you plug  
17 the -- plug the receiver into the electronic speed controller.  
18 And obviously that battery, that Sub-C pack, is in there  
19 providing power for the car in normal operation.

02:20 20 What has to happen is that receiver has to be connected to  
21 that transmitter. And then in the manufacturer -- in the  
22 literature it's available, and then even in that particular  
23 manual that transmitter has a code, an identifier, a number.  
24 And basically, you have to bind that receiver to that  
25 transmitter so they can talk to each other.

1       And once that's done, that function's performed, then the  
2 receiver's bound to that transmitter, then you can use that  
3 controller and turn the steering wheel or press the trigger to  
4 that controller and the car will perform, you know, whatever  
5 desired function you have in normal operation.

6       And this particular -- this particular type of this  
7 manufacturer, Flysky, they use, in their literature,  
8 frequency-hopping. And basically, that's just one type of  
9 system that's used for this particular transmitter/receiver.  
02:21 10 And then other manufacturers use a different type of  
11 technology -- or called "digital sequencing."

12       There's two different ways to run your R/C cars, but this  
13 particular one, you have to make sure that you have the  
14 compatible type of receiver/transmitter to perform driving an  
15 R/C car or boat.

16 Q.     Okay. So was that receiver connected to the electronic  
17 speed controller which was connected to the initiator, the  
18 Christmas tree bulb?

19 A.     It was. But I mean, all that was all damaged. But that  
02:22 20 had to be connected up in that -- we talked a fusing system to  
21 operate the improvised initiator in this particular scene.

22 Q.     Continuing on, did you find a toggle switch?

23 A.     Yeah. Like I said before, testing the functionality and  
24 seeing how these things were constructed, we noticed without  
25 just putting the receiver, the electronic speed controller in

1 there with the battery and then hooking it up to an improvised  
2 initiator, in this particular -- in this particular electronic  
3 speed controller, when you hit the little slide switch and  
4 power it up where it initializes and the receiver then receives  
5 power, it's sent output signal to the two leads that were  
6 connected to our improvised initiator, which we used as a  
7 Christmas tree bulb, and it basically lit the bulb momentarily,  
8 so...

9 And we also -- during the scene, through all that  
02:23 10 material, we found the remnants of a heavily damaged -- what  
11 was a toggle switch. We couldn't identify it, but it was an  
12 illuminated toggle switch. And that was within the parts that  
13 we looked at. And for this particular device at Scene A, had a  
14 toggle switch also which sometimes they're referred to as a  
15 safe-and-arming switch, because if you turn that little slide  
16 switch on the electronic speed controller on, and it's sent  
17 that output to that Christmas tree bulb to light it up, it  
18 would have detonated the bomb.

19 So to interrupt that circuit, a toggle switch, just like a  
02:24 20 light on your on-and-off switch, it broke the circuit -- it  
21 just needed to be done for a few seconds, and then the toggle  
22 switch just needed to be flipped to the armed position. And  
23 then once you went and gave it the appropriate signal from the  
24 transmitter, it would function the Christmas tree lightbulb.

25 Q. So are you saying for that receiver to bind with the

1 transmitter without actually igniting the Christmas tree light,  
2 you need to have this toggle switch on?

3 A. No, the binding of the receiver and transmitter is already  
4 complete. It's basically -- the transmitter you can set aside.  
5 You're not worried about -- we're not worried about the  
6 transmitter. It's the fusing system. You needed a toggle  
7 switch within -- between -- to break the continuity between the  
8 electronic speed controller, the receiver battery, just had to  
9 have a break in that continuity. Because if you didn't, if you  
02:25 10 didn't have that toggle switch in when the receiver, electronic  
11 speed controller and battery are all put together, and we  
12 tested it with a Christmas tree lightbulb on the outputs of  
13 that electronic speed controller, when you slid and powered up  
14 that electronic speed controller, it had enough output to send  
15 current down to that Christmas tree lightbulb momentarily for a  
16 second or two, but it would light up, so...

17 And we found in the evidence, like I said, that damaged  
18 toggle switch. And that toggle switch was used to break that  
19 once you turned on the electronic speed controller, and then  
02:26 20 they flipped it on to the -- or someone would flip it on to the  
21 armed position then, and now it's armed and it's just waiting  
22 for a signal from the transmitter.

23 Q. So the toggle switch was necessary for the arming  
24 procedure?

25 A. Yes. In that particular scene.

1 Q. So for that scene, the pressure cooker pot, somebody would  
2 have had to turn on the device before deploying it?

3 A. In both of them. But in this particular instance, just  
4 the way that electronic speed controller sent a signal or  
5 output to that -- where that Christmas tree -- improvised  
6 Christmas tree bulb would have been, it would have set it off.

7 Q. And this toggle switch -- was there a similar toggle  
8 switch found in Scene B?

9 A. No.

02:26 10 Q. Now, in addition to this fusing mechanism, did you find an  
11 alternative fusing mechanism for the device at Scene A?

12 A. Yes, we did. We found a very small piece of what we  
13 talked before, hobby fuse, that green hobby fuse that's used in  
14 fireworks. There was two pieces taped up with electrical tape.  
15 And they were at both scenes also.

16 Q. I'm putting up on the screen Q192. Is that the hobby fuse  
17 that was recovered from the site of Scene A?

18 A. Yes.

19 Q. So can you explain why there would be hobby fuse in a  
02:27 20 device that already had an electric fusing system?

21 A. Well, there was two forms of initiation. We talked  
22 before, there's electrical and non-electrical. The primary  
23 means of initiation would be electrical by remote-control car,  
24 but if somehow that failed, then all you would have to do is,  
25 you know, light the hobby fuse and walk away, and that would be

1 sufficient to set off the low explosive.

2 So, you know, when I saw that there, just that  
3 small -- that small piece, it appeared that it was cut off --  
4 once that violent reaction, that explosion, it was cut off, and  
5 that was the small fragment that remained amongst the many  
6 pieces of debris at each scene.

7 Q. So when someone lights hobby fuse, describe what the  
8 deflagration looks like.

9 A. It's just you light it with a match or a lighter, and it  
02:28 10 starts burning and it's giving off smoke. It might smell like  
11 a sulphur smell, but it's burning down. And there would be  
12 smoke around.

13 Q. And does it take a little bit of time depending on how  
14 long it is?

15 A. Right. Normally it's two seconds per inch, but it varies.  
16 But it's just commonly available, manufactured hobby fuse.

17 Q. In fact, for both of the scenes on Boylston Street, did  
18 you find evidence of hobby fuse?

19 A. Yes.

02:29 20 Q. In addition, did you find components of a container?

21 A. Yes, the Fagor container.

22 Q. That's Q10. What's that?

23 A. That's the lid of the pressure cooker.

24 Q. And did -- the deformities to this pressure cooker, what's  
25 that evidence of?

1 A. An explosive event. And you could see it was crisscrossed  
2 with tape. The container had tape on it. And it was  
3 crisscrossed around the container also.

4 Q. You're referring to the kind of clear marks here?

5 A. That's correct.

6 Q. And this particular lid was found some distance away?

7 A. Yes, it was found some distance away.

8 Q. So according to the interactive exhibit where I'm hovering  
9 over here, does that sound right? I know you weren't on the  
02:30 10 scene --

11 A. I wasn't at the scene but...

12 Q. Were there also components of the backpack that was used  
13 to conceal these devices?

14 A. Yes. It's identified as a Ful backpack.

15 Q. Going to Q109, just quickly scroll through these, are  
16 these the lab photos of that backpack?

17 A. That's correct.

18 Q. And I'm sorry. This identified the brand as Ful?

19 A. And then on the inside, in the liner of the material  
02:31 20 there, it had the Ful brand in there.

21 Q. All right. Now let's move on to Scene B. And as with  
22 Scene A, did you find radio-controlled remote-control  
23 components?

24 A. Yes, we did.

25 Q. Calling up Q41, what are these?

1 A. That's a portion of another -- an electronic speed  
2 controller, but that was -- there was two portions to that, and  
3 that was a Duratrax Sprint electronic speed controller.

4 Q. And the Duratrax speed controller, that's different from  
5 the Accede that you found at Scene A?

6 A. Yes; just a different type of electronic speed controller.

7 Q. What does the speed controller do in a typical  
8 remote-control car?

9 A. I said it went and basically provided power to the motor,  
02:32 10 if you wanted to go faster or slower, reverse or forward. And  
11 it would provide the input, and the current would go and engage  
12 the motor. And it would go forward, backwards or slower or  
13 faster.

14 Q. Thank you. And so Q52, is this another portion of the  
15 electronic speed controller?

16 A. Yeah, that's a piece off that -- 52 and 51 is the board,  
17 the electronic speed controller board.

18 Q. Did you also find evidence of a receiver at --

19 A. Yes.

02:33 20 Q. A remote-control receiver?

21 A. Yes, we did.

22 Q. Q122: Do you recognize that?

23 A. Yes; that's a Spektrum receiver.

24 Q. The company Spektrum?

25 A. Yes.

1 Q. "Spektrum" with a K?

2 A. Yes.

3 Q. It looks like there's -- the name is printed actually  
4 here. Is that right?

5 A. That's correct.

6 Q. Now, how does the Spektrum receiver differ from a Flysky  
7 receiver?

8 A. As we talked before, it's just how they communicate and  
9 what technology that manufacturer had. And that was direct  
02:34 10 sequencing. It's just a different way that it talks to the  
11 receiver/transmitter. But the same process of binding -- you  
12 know, they have their receiver and transmitter. The  
13 transmitter has a unique ID, and basically it is bound. Once  
14 you bind that to the transmitter, they will talk, like  
15 communicate.

16 Q. Did you also find a power source at Scene B?

17 A. Yes, we did. A damaged Tenergy Sub-C pack.

18 Q. Is that --

19 A. That's the brand name, the Tenergy battery.

02:34 20 Q. Another battery pack?

21 A. Right.

22 Q. Did you also find evidence of the hobby fuse?

23 A. Yes, we did.

24 Q. And then finally, did you find portions of the backpack  
25 itself?

1 A. The Fox backpack, yes.

2 Q. This was different from the Ful backpack?

3 A. Correct.

4 Q. And finally, the -- did you find pieces of the container  
5 as well?

6 A. Yes. The container again -- once again, it was a Fagor  
7 pressure cooker. And there was also, you know, we talked  
8 before, fragmentation, some small nails and BBs in this scene,  
9 and compared to just the BBs in Scene A.

02:35 10 Q. Now, we've just looked at a sampling of some of the pieces  
11 of evidence, but did you examine each piece of evidence and  
12 come up with the configuration of how you surmised that these  
13 devices were constructed?

14 A. Well, yes, the configuration that these particular R/C  
15 components had to be put into and how they would have  
16 functioned the device.

17 Q. And did you create mockups?

18 A. Yes, we did.

19 Q. And you described how you went out and bought components.  
02:36 20 How did you configure the mockup devices?

21 A. Based on the -- what was found at the scenes, the  
22 particular type of transmitters/receivers, we purchased  
23 the -- there was a -- we actually purchased several monster  
24 rally trucks where the electronic speed controller, the power  
25 source, everything was provided. It was a full, intact one,

1 which was the same components found at the scenes.

2 And then we -- then I went and constructed the fusing  
3 system, like I talked about, placing the receiver, binding it  
4 with a transmitter, and then hooking up a -- in this  
5 particular, just hooking up a Christmas tree bulb to it.

6 Q. And for the device at Scene B, you described earlier that  
7 there was no toggle switch found?

8 A. Right. We -- I said before we tested those -- that  
9 Spektrum receiver with the Duratrax. And when I talked before  
02:37 10 about having to initialize and we have to turn on the  
11 electronic speed controller in Scene A, power -- some output  
12 went to those two leads that had the Christmas tree bulb.

13 When we tested it for the Duratrax electronic speed  
14 controller hooked up, there was no output. It didn't light up  
15 the Christmas tree bulb, and there was no evidence of a toggle  
16 switch remaining at the scene. But it did not function it,  
17 once you powered it, initialized it up, so the light did not  
18 come on.

19 Q. So unlike the device at Scene A, the device at Scene B  
02:38 20 with that Spektrum receiver and the Duratrax electronic speed  
21 controller, when you armed it, it didn't set off the Christmas  
22 tree lightbulb?

23 A. That's correct. The fusing system there, yes.

24 Q. But like the Scene A, did that device have to be armed  
25 before it was deployed?

1 A. You had to turn on that slide switch so it would power up,  
2 and then it's waiting for the signal from the transmitter.

3 Q. Let's talk a little bit before we move on about -- you  
4 described the components within the fusing system of the  
5 pressure cooker. What else would have been -- what else did  
6 you find evidence of within the pressure cookers?

7 A. Well, within the pressure cooker, the way they were  
8 constructed, there was, I said -- in Scene A there were the  
9 copper -- the BBs, and there was pink material, a red  
02:39 10 rosin-type paper backing. But some of the BBs, we found that  
11 they had some adhesive -- sealant-type material -- they were  
12 like embedded into the sealant-type material.

13 And also in Scene B, likewise, the same type of material  
14 was found. They had the BBs. Or there was BBs and then there  
15 was some small nails in it. And also there was -- we started  
16 seeing when all this evidence came in, there were pieces of  
17 cardboard -- circular pieces of, like, fragmented cardboard  
18 with duct tape taped around the edges of it. And we started  
19 noticing each scene had cardboard, and then there were some  
02:40 20 tape associated with those.

21 Q. And then you also described, I think, some tape on the  
22 exterior of one of the --

23 A. Well, and each device, basically it was crisscrossed with  
24 tape around the pod.

25 Q. So before deploying that device, someone would have had to

1 arm the device and then resealed it before deploying it?

2 A. They would have had to go in and make sure the slide  
3 switch on that electronic speed controller was on so it would  
4 power up that fusing system, what we talked about, the  
5 components of it.

6 Q. And then resealed the container, the vessel?

7 A. Yes.

8 Q. And is that because the low explosive --

9 MR. WATKINS: Objection to the leading nature, your  
02:40 10 Honor.

11 BY MR. CHAKRAVARTY:

12 Q. Why does a low explosive need to have a sealed container?

13 A. Well, it builds up pressure. But we've done tests  
14 where -- I mean, low explosives, it just has to have enough  
15 confinement and then it can, you know, explode, you know, and  
16 the container can fragment. But we've done tests where you  
17 don't have, like, say on a pipe, two end caps. One might be  
18 off and it's still -- that's enough confinement to detonate  
19 that pipe, so...

02:41 20 And even if you have enough material by itself, the weight  
21 of that material can cause enough confinement to start a  
22 violent reaction and explode.

23 Q. When you say "material," you mean explosive material?

24 A. Yeah, by itself the way that -- if you have enough.

25 Q. And is there a correlation between how sealed -- how

1 confined something is with how violently it will explode?

2 A. Of course if you have, you know, a heavier case, you know,  
3 a thicker pipe -- you know, it just has to have enough  
4 confinement in it. But, you know, if it's a thicker pipe,  
5 sealed better, time to build up more pressure, but it relieves  
6 itself, but just enough confinement. And in this case there's  
7 enough confinement to explode these two containers.

8 Q. In exploding a container, breaching the confinement, does  
9 that in itself create fragmentation?

02:42 10 A. That's -- the container itself is fragmentation along with  
11 the added fragmentation.

12 Q. And when it -- when an explosion breaches a containment  
13 vessel, how does the physics work in terms of breaking the  
14 containment?

15 A. It just depends, you know, low explosives, how violently  
16 they react. You might have bigger pieces or smaller pieces  
17 depending on the explosives that were used.

18 Q. Okay. So in addition to the gas being released, is that  
19 also when the thermal effect occurs?

02:43 20 A. Well, initially we talked before, the closer the thermal  
21 effect is closer to, you know, the explosive or the seed, and  
22 then the fragmentation and the pressure is radiating out.

23 Q. Does it radiate out in any specific direction?

24 A. It's just 360. Just pressures are built up, and 360  
25 degrees out, just imparting that onto the surrounding

1 environment or whatever else is in its way.

2 Q. Let me show you a couple of photographs.

3 (Pause.)

4 Q. Agent Knapp, I just wanted to show you a few photographs  
5 to see if these are consistent with what the effect is of an  
6 explosion on a containment vessel.

7 MR. CHAKRAVARTY: Can we go to 2D, please?

8 THE COURT: Is this something in evidence?

9 MR. CHAKRAVARTY: I'm first going to go to the 2D  
02:44 10 which is in evidence, your Honor. Sorry.

11 BY MR. CHAKRAVARTY:

12 Q. Agent Knapp, what does this show?

13 A. That is the fragmented remains of a pressure cooker.

14 Q. And the distortions of the ends and the discoloration, is  
15 that all effects of the explosion?

16 A. Could you repeat that?

17 Q. The distortions at the ends -- the edges of the metal, is  
18 that all the result of an explosion versus something else that  
19 may have been done to it?

02:45 20 A. It was ripped apart in the explosion. It came apart, the  
21 container.

22 Q. And do you notice that there appear to be some  
23 indentations here, almost as if stamped out of the metal?

24 A. Right.

25 MR. CHAKRAVARTY: Now, if I can have one moment. I

1 wanted to see if -- rather than using the ELMO, see if we could  
2 project it out electronically.

3 Just for the witness, your Honor. It's not in  
4 evidence.

5 Q. Agent Knapp, showing you an exhibit marked 1582, do you  
6 see the grates at the bottom of this photo?

7 A. Yes.

8 Q. Are those indentations on Q126 --

9 MR. WATKINS: Objection, your Honor. This is the  
02:47 10 subject of expertise, and this is not an expert in that.

11 THE COURT: All right. Overruled. I'll allow the  
12 answer.

13 BY MR. CHAKRAVARTY:

14 Q. Are the indentations that we just saw on Q126 consistent  
15 with the pattern on the grate depicted in this 1582?

16 A. When this device went off, it was placed close to the  
17 ground and then the force was imparted on it and it just left  
18 impressions in the metal on the container that was fragmented  
19 from that grating.

02:47 20 MR. CHAKRAVARTY: So I'd move in Exhibit 1582, your  
21 Honor.

22 MR. WATKINS: Objection.

23 THE COURT: Overruled. I'll admit it.

24 (Government Exhibit No. 1582 received into evidence.)

25 BY MR. CHAKRAVARTY:

1 Q. Again, was the grating that you're talking about this type  
2 of grating?

3 A. Yes.

4 MR. CHAKRAVARTY: Mr. Bruemmer, if we can go back to  
5 the 2D and call up...

6 Q. And this is what I had identified earlier as that kind of  
7 stamp?

8 A. Correct.

9 Q. Now, going to -- moving on to the Watertown crime scene,  
02:48 10 did you use a similar methodology to examine the evidence at  
11 Watertown as you did for the Boylston Street explosions?

12 A. Yes.

13 Q. And did you identify -- let's first talk about the  
14 pressure cooker device there. Did you identify the vessel that  
15 was used?

16 A. It was a smaller Fagor pressure cooker.

17 Q. So for the Watertown scene, Agent Knapp, I think I'm just  
18 going to show you the physical items because I don't have the  
19 exhibit numbers -- excuse me -- the photo numbers handy.

02:49 20 So there was a Fagor pressure cooker device that was  
21 smaller, I think you said earlier?

22 A. Just a little smaller in size, yes.

23 Q. And the fact that it was smaller, what significance did  
24 that have to you as an explosives analyst?

25 A. Nothing.

1 Q. And does it matter how large a vessel it is for purposes  
2 of determining an explosion analysis?

3 A. No.

4 Q. Why is that?

5 A. Obviously the -- I mean, obviously if it's bigger, you can  
6 put more explosives in it. But, I mean, it's just a  
7 containment vessel and it just happened to be that size.

8 Q. And so how much -- the fact that it's a smaller vessel  
9 means that it can hold less items. Is that fair to say?

02:50 10 A. Material.

11 Q. Material?

12 A. Possibly.

13 Q. So were you able to estimate how much explosive material  
14 was in these devices?

15 A. In the Scene A and Scene B?

16 Q. Start with wherever you want.

17 A. You know, for the -- I mean, they were -- the same size  
18 pressure cookers in Scene A and Scene B, and they were like  
19 six-liter-size pressure cookers, and roughly -- it could be  
02:51 20 anywhere from eight pounds to 16 pounds in those pressure  
21 cookers. And obviously, the other one was a four-liter,  
22 four-quart size. And obviously, that would be a smaller, you  
23 know, eight pounds in there, so forth, approximating.

24 Q. And you're approximating. That's estimating if it was  
25 half full of explosive material?

1 A. Half full to full.

2 Q. So that's the range that you described?

3 MR. WATKINS: Objection to the leading, your Honor.

4 THE COURT: Overruled to that question.

5 BY MR. CHAKRAVARTY:

6 Q. Now, for the Watertown scene, in addition to the Fagor  
7 pressure cooker, which we've seen photos of the lid and the  
8 vessel, what other components of significance were there?

9 A. In the pressure cooker itself, obviously when that went  
02:52 10 off, they did find wire, a 9-volt battery and a toggle switch  
11 at the scene. And then they also had collected two intact pipe  
12 bombs. One was an elbow and one was a straight coupler. And  
13 they had internal end plugs. And then they also collected  
14 fragmentation, or bits and pieces, of pipe at that scene. And  
15 they also collected a container with material in it with green  
16 hobby fuse coming out of the lid.

17 Q. So you said a few moments earlier that it doesn't really  
18 matter how sealed something is or -- in terms of whether it  
19 will explode. Would the device that was made out of plastic  
02:52 20 that had powder in it and hobby fuse, would that have exploded  
21 like an IED?

22 A. There's confinement there, and that just happens to be  
23 plastic. But there's confinement, and that right there was a  
24 device also because it had all the components, the  
25 non-electrical fusing system, the main charge and the

1 container.

2 MR. CHAKRAVARTY: Can we call up Image 951, please?

3 I'm sorry. 957.

4 Q. This is a Q photo of 582. Do you recognize that?

5 A. That's a toggle switch that was found at Watertown.

6 Q. And what significance did that have to the device?

7 A. Well, there was -- it was connected. They had a  
8 9-snap-volt battery connector. There was a 9-volt battery  
9 found. That toggle switch with a length of wire, that right  
02:54 10 there -- obviously there was no initiator on the end of the  
11 wires, but that was found at some distance away from the  
12 pressure cooker. And as far as in my course of investigation,  
13 being overseas, you have a toggle switch, and basically it's  
14 just an on-and-off switch, you have a power source, and you'd  
15 have some type of initiator at the end of that. And all you do  
16 was to close the circuit, just flip the toggle switch. And if  
17 that was in an explosive, it would detonate and explode.

18 Q. So this was another way to trigger an explosive device?

19 A. Well, in --

02:54 20 MR. WATKINS: I'm going to object, your Honor. That  
21 wasn't his testimony.

22 THE COURT: Yeah, sustained to that.

23 BY MR. CHAKRAVARTY:

24 Q. So let's just clarify a few things. You mentioned that in  
25 the course of the investigation you have come to learn this.

1 Do you mean in the course of your training and experience as an  
2 investigator?

3 A. In dealing with material coming in, or overseas, bombing  
4 investigations, seeing the type of fusing systems out there.  
5 And this is a particularly used -- what we normally have is --  
6 a dead-man's switch or a suicide bomber would have this type of  
7 configuration.

8 MR. WATKINS: I'm going to object, your Honor.

9 THE COURT: No, overruled. That may stand.

02:55 10 BY MR. CHAKRAVARTY:

11 Q. And in addition to this system, was there  
12 another -- evidence of another fusing system found on Laurel  
13 Street?

14 A. Well, there was the hobby fuse. It's non-electric.  
15 Basically, the burning of the green hobby fuse. They had it in  
16 the pipes; they had it in the container, the plastic container.

17 MR. CHAKRAVARTY: One moment, your Honor. I believe  
18 Exhibit 957 is in evidence, but I'm not sure whether it's the  
19 image or the physical piece of evidence. I'm just confirming  
02:56 20 that.

21 (Pause.)

22 MR. CHAKRAVARTY: So, your Honor, I believe 957 is the  
23 physical piece of evidence. If I could offer this exhibit as  
24 957A, which is a photo of that.

25 MR. WATKINS: No objection.

1 THE COURT: Okay.

2 (Government Exhibit No. 957A received into evidence.)

3 BY MR. CHAKRAVARTY:

4 Q. This is that switch that you just described that was found  
5 in Watertown?

6 A. Yes, it was.

7 MR. CHAKRAVARTY: I'd call up Exhibit 1122.

8 THE COURT: Is this in or not?

9 MR. CHAKRAVARTY: Again, it is in, your Honor. I  
02:57 10 just, again, don't know if it's physical or --

11 (Pause.)

12 MR. CHAKRAVARTY: Your Honor, similarly, if not, I'd  
13 make clear that this is 1122A, which is a photograph of --

14 THE COURT: All right.

15 MR. CHAKRAVARTY: Q71.

16 (Government Exhibit No. 1122A received into evidence.)

17 BY MR. CHAKRAVARTY:

18 Q. And so this is the lid that you were mentioning earlier?

19 A. Of the container? Yes.

02:57 20 Q. So there's hobby fuse on here that we can see. Is that  
21 fair to say?

22 A. Yes. It was coming out of the lid of the container.

23 Q. So in addition to this hobby fuse, was there other hobby  
24 fuse found in Laurel -- at the Watertown scene?

25 A. There was a bit of hobby fuse inside the container, so

1 with the powder that was in there.

2 Q. And so the pressure cooker device that was exploded, was  
3 there any hobby fuse associated with that, or how did you  
4 determine that?

5 A. You couldn't determine -- I mean, usually, hobby fuse  
6 burns. That explosion happened, and the hobby fuse usually is  
7 no longer there.

8 MR. CHAKRAVARTY: May we go to Exhibit 848.

9 I'm not sure whether this is in evidence.

02:58 10 Q. Do you see this area over here?

11 A. Yes.

12 Q. Is that significant to you?

13 A. It looks like a darker spot in the ground.

14 Q. What happens when an IED explodes on asphalt?

15 A. It can leave a cratering pattern or it could leave some  
16 residue near there.

17 MR. CHAKRAVARTY: If we could go to Exhibit 852.

18 This is in evidence, your Honor.

19 Q. Is this that collection of hobby fuse that you were  
02:59 20 talking about?

21 A. Yes.

22 MR. CHAKRAVARTY: Go to Exhibit 853.

23 Q. This is another angle.

24 MR. CHAKRAVARTY: Could we go to Exhibit 833, please.

25 834.

1           I don't think that's in evidence, your Honor.

2           THE CLERK: 834 is in.

3           MR. CHAKRAVARTY: 834 is in, yes.

4           THE COURT: Is or isn't?

5           MR. CHAKRAVARTY: 834 is. My apologies, your Honor.

6 BY MR. CHAKRAVARTY:

7 Q. Is this one of those rendered-safe pipe bombs that were  
8 found in Watertown?

9 A. Correct.

03:00 10 Q. Could you describe the configuration of this?

11 A. That was an elbow pipe, two-inch diameter with internal  
12 end plugs, it had some Teflon tapes on the threads, and then on  
13 the inside it had, once again, BBs inside, encased inside, and  
14 there was a green hobby fuse coming out of a hole that was in  
15 the elbows.

16           MR. CHAKRAVARTY: Could we do 842, which is also in  
17 evidence.

18 A. That shows you a picture of the inside, but the same  
19 thing. That's just a straight coupler with the internal end  
03:01 20 plugs and hobby fuse coming out of it.

21 Q. And like the other mockup devices that you made, did you  
22 make mockup devices of each of these devices: the pipe bombs,  
23 the plastic container containing hobby fuse and explosive  
24 material, as well as the pressure cooker that was found in  
25 Watertown?

1 A. Yes.

2 Q. In addition to the explosives, the exploded IEDs -- the  
3 remnants of the exploded IEDs as well as the rendered-safe, did  
4 you also find a transmitter in Watertown?

5 A. Yes, there was a transmitter that was submitted with this  
6 evidence.

7 MR. CHAKRAVARTY: And if we could call up Exhibit 949,  
8 which I would move into evidence 949A as a photo of this.

9 MR. WATKINS: No objection.

03:02 10 THE COURT: Okay.

11 (Government Exhibit No. 949A received into evidence.)

12 BY MR. CHAKRAVARTY:

13 Q. And what is that?

14 A. That's the modified Flysky transmitter, or basically the  
15 R/C hobby controller.

16 Q. So you said it's a modified Flysky. Is "Flysky" the name  
17 brand?

18 A. Yes, of the transmitter, the controller.

19 Q. And so it's the same name brand as the receiver that was  
03:02 20 found at Scene A?

21 A. That's correct.

22 Q. And you said it was modified. How was it modified?

23 A. Well, normally if you had an intact one, there's the  
24 battery pack on the bottom, and it has like a pistol grip where  
25 you can hold it, and on the top it has the -- that -- that's

1 the electronic display. And there's usually buttons up there.  
2 And then on one side there's a little steering wheel, and it  
3 has -- on the grip there's like a little trigger for operating,  
4 you know, the forward and reverse of your car and the steering  
5 wheel to turn your R/C car.

6 Q. Now, as part of the investigation, did the FBI obtain  
7 various receipts or other records to see whether there were  
8 other radio-controlled/remote-controlled components involved in  
9 the case?

03:03 10 A. Yeah, other receipts had come in of purchases.

11 Q. Right.

12 MR. CHAKRAVARTY: If we could call up Exhibit 1160,  
13 please, which I believe is in evidence. Page 2.

14 Q. Is this one of the receipts that you reviewed?

15 A. This is one of them that had come in.

16 Q. And could you describe the items on this receipt?

17 A. Up on the top you see the "Accede R/C electric rally  
18 Monster Off-Road Rally Truck, stripe blue." That was a whole  
19 intact package of an actual R/C car. We purchased several of  
03:04 20 those for our exemplars.

21 Q. Did you find any evidence related to that vehicle, like --

22 A. On that one, the electronic speed controller and the --  
23 the electronic speed controller, the receiver and the battery  
24 were found at Scene A.

25 Q. Okay. Please continue.

1 A. And then there's a -- it looks like there's a transmitter  
2 and receiver, and then another receiver, a Flysky receiver, in  
3 that list.

4 Q. And is there also some batteries?

5 A. Right.

6 Q. So this transmitter and receiver, does the "FS" stand for  
7 Flysky?

8 A. Yeah. That's the model number, Flysky model.

9 Q. All right. And so this entry is for a combination package  
03:05 10 of both the transmitter and the receiver that are compatible  
11 with each other?

12 A. Yes.

13 Q. And the last entry is for an extra receiver. That's also  
14 compatible with those?

15 A. Correct.

16 MR. CHAKRAVARTY: Can we call up Exhibit 1431, please,  
17 also in evidence.

18 Q. Did you also have an opportunity to learn more about what  
19 this was a receipt for?

03:06 20 A. That was a receipt for a transmitter -- what we talked  
21 about before, the Spektrum transmitter -- controller and a  
22 receiver.

23 Q. And so was the receiver consistent with the receiver, the  
24 remnants of which were found at Scene B?

25 A. Yes.

1 Q. Did you ever find in the investigation the Spektrum  
2 controller?

3 A. No.

4 Q. In fact, were there any other controllers found in the  
5 investigation aside from the one we just saw from Watertown?

6 A. No.

7 Q. Was the Spektrum receiver that was found in Scene B -- was  
8 that compatible with the Flysky receiver that we were just  
9 looking at?

03:07 10 A. We talked about -- earlier about the two different ways  
11 they communicate those two different manufacturers have, the  
12 frequency hopping and then the direct sequencing. That's not  
13 compatible with -- the Spektrum receiver with the Flysky  
14 transmitter.

15 MR. CHAKRAVARTY: Back to 949A.

16 Q. Did you determine whether this transmitter bound with the  
17 receiver that was found on Scene A?

18 A. Did I --

19 MR. WATKINS: Objection, your Honor.

03:08 20 THE WITNESS: Basically --

21 MR. WATKINS: Objection.

22 THE WITNESS: Basically --

23 THE COURT: Wait. Hold on a moment.

24 Is it related to disclosure?

25 MR. WATKINS: No.

1                   THE COURT: Let me just see you briefly.

2                   (Discussion at sidebar and out of the hearing of the  
3                   jury:)

4                   MR. WATKINS: So this relates to the so-called binding  
5                   testimony. I had filed a motion in limine. The Court's never  
6                   ruled on that. It's actually not this witness that did any of  
7                   the work.

8                   We've agreed, I thought up until now, that we would  
9                   allow a certain amount of testimony by Agent Knapp here that  
03:08 10           included work done by other people for him. I specifically --  
11                  when we were talking about this carved-out -- that binding code  
12                  issue, I had understood up until this minute that he would not  
13                  seek to admit that through Agent Knapp. I believe it's  
14                  complete hearsay as to this agent. He didn't run any of the  
15                  tests that would result in that conclusion. I don't even think  
16                  the other one had, ran a test.

17                  So I'm asking that that be excluded.

18                  MR. CHAKRAVARTY: The intention is not to elicit that  
19                  the binding code is the same on each. He didn't do a test to  
03:09 20           figure out what the binding code was. But he can say -- he's  
21                  going to say -- what I wanted to elicit -- and I can ask  
22                  another question to elicit that -- is was the Flysky receiver  
23                  that was found compatible with the Flysky receiver that was  
24                  found in Watertown. The transmitter pair -- were they  
25                  compatible with each other. And if they determined that they

1       actually were -- worked together, I guess is the correct --

2                   MR. WATKINS: That is not the question you asked. You  
3       said "bind." If you want to ask are they compatible, that's  
4       good.

5                   THE COURT: What does "compatible" mean?

6                   MR. CHAKRAVARTY: That they can talk to each other as  
7       opposed to --

8                   THE COURT: Right. And how is that different from  
9       binding?

03:10 10           MR. CHAKRAVARTY: So binding is the more precise idea  
11       that there was a specific code on one that matched the code on  
12       the other. And my point is I want to be more general but still  
13       show that these two can talk to each other, and they can't talk  
14       to the device on Scene B.

15                   THE COURT: Well, I think he's already said the  
16       latter. I don't think --

17                   MR. CHAKRAVARTY: Yes.

18                   THE COURT: Okay.

19                   MR. WEINREB: I'm sorry, your Honor. Before we  
03:10 20       leave --

21                   THE COURT: Yeah.

22                   MS. CLARKE: While I've got you.

23                   (Laughter.)

24                   MR. WEINREB: Can I just add that -- I'd assume that  
25       the binding code like -- the reasoning -- the defense is not

1 going to be permitted to inquire of this witness about binding  
2 codes, or specifically to ask questions intending to  
3 elicit -- if he is going to ask questions intending to suggest  
4 to the jury that Tamerlan Tsarnaev might have detonated at the  
5 scene two bombs, that would be trying to -- asking the jury to  
6 assume facts not in evidence in bad faith because the defense  
7 knows that Jahar Tsarnaev in fact did detonate the second bomb.  
8 And to ask questions to elicit otherwise would not be  
9 good-faith cross-examination.

03:11 10 THE COURT: Okay. Is there an issue?

11 MR. WATKINS: There is an issue, your Honor. It's a  
12 longer issue. I understand the Court is going to break at  
13 12:45. I don't know how much Mr. Chakravarty has left. I'm  
14 not sure that that won't --

15 MR. CHAKRAVARTY: There's not much more other than  
16 he's going to explain the mockups that he created, we're going  
17 to do a demonstration, and then we're going to talk about the  
18 *Inspire* magazine. I think if we're breaking early for lunch  
19 today, it would take us at least to that.

03:11 20 MR. WATKINS: So I will consider what Mr. Weinreb has  
21 talked about, and we will come to some kind of agreement on  
22 that, or agree to disagree.

23 THE COURT: Well, okay. I'll leave it at that for  
24 now.

25 MR. CHAKRAVARTY: One other point that might implicate

1       this again is before we do the mockup and the demonstration,  
2       he's going to -- he had created a device, and he was going to  
3       actually activate the device. In order to do that, he has to  
4       bind the transmitter with the receiver, so -- which he's  
5       already explained there is a binding process, and now he's  
6       bound to that.

7                   THE COURT: Is it in his disclosure that he's going to  
8       do that?

9                   MR. WATKINS: We're getting into larger issues here.

03:12 10       We spoke on Sunday about some of the -- Mr. Chakravarty, I  
11       think, is going to introduce some mockups of each of these  
12       individual items and do some demonstrations. That was one of  
13       them that I identified that we would object to, that -- using  
14       that mockup, because that essentially gets them to the same  
15       place where their expert that they did not call would try to  
16       get them.

17                  THE COURT: Isn't that part of the instructions that  
18       comes with the car?

19                  MR. CHAKRAVARTY: It is. That's the only way these  
03:13 20       cars would work.

21                  THE COURT: I don't know if that's expert. That's  
22       just sort of -- it's the way some 12-year-old gets the car to  
23       run.

24                  MR. WATKINS: That is true as a general matter, but  
25       what they are trying to prove is that this specific one bound

1 with that specific receiver down there, and that is the subject  
2 of expert testimony. It could have, but for them to say that  
3 it absolutely did...

4 THE COURT: Well, that it could be the subject of  
5 expert testimony doesn't necessarily mean that it is; in other  
6 words, it might be an inference from other non-expert evidence.  
7 I don't know. It depends on how it's presented. But it sounds  
8 elementary, that you have to punch in the code that you have to  
9 use in order to identify the car to the transmitter.

03:13 10 MR. WATKINS: That part of it is true, that they would  
11 identify -- that the two of them -- whether this particular  
12 transmitter identified with this particular receiver -- it's  
13 not functioning anymore. They can't do it. They're unable to  
14 do it, so they do it in a roundabout way.

15 MR. CHAKRAVARTY: That's a separate question. In the  
16 actual piece of evidence versus in the exemplar, which he has  
17 to say that's what he did in order to get the thing to work.

18 MR. WATKINS: And that's why I think it's  
19 objectionable. It doesn't come in because of that exact  
03:14 20 reason.

21 THE COURT: No, I think he can say that's what he did.  
22 He's not offering an opinion about these two other devices, so  
23 he could go there.

24 MR. WATKINS: Okay. As long as -- because we're up  
25 here and we're talking about the mockups, there's also a mockup

1 of the so-called Tupperware bomb. I don't think that comes in  
2 at all because they don't have the same Tupperware container.

3 MR. CHAKRAVARTY: We're going to use the amount of  
4 powder in the Tupperware. There's an inert material that  
5 they're using as an example of that. That I wanted to put into  
6 the actual piece of evidence so that the jury can see how heavy  
7 this thing is. So we wouldn't be moving the Rubbermaid in, but  
8 we would be moving the material inside of the bag.

9 MR. WATKINS: So as I understand it, they're mixing  
03:15 10 exemplar material with an actual exhibit. I would object on  
11 that ground because they're moving those two things in --

12 MR. CHAKRAVARTY: The exemplar would be the  
13 separate -- would be a new exhibit number, and we would put  
14 that new exhibit number in an existing exhibit number for  
15 demonstrative purposes. It wouldn't itself --

16 THE COURT: Why can't you just have a similar  
17 container?

18 MR. CHAKRAVARTY: We have a similar one. That's what  
19 Mr. Watkins is objecting to.

03:15 20 MR. WATKINS: They bought the wrong darn container. I  
21 mean, it's the wrong size; it's the wrong color.

22 MR. WEINREB: We have the actual container. We can't  
23 put real explosive powder in it, so we're proposing to put  
24 substitute explosive powder.

25 THE COURT: As long as it doesn't alter the exhibit.

1                   MR. CHAKRAVARTY: It won't alter the exhibit. I'll  
2 see if they can do it.

3                   MR. WATKINS: And then finally, the government is  
4 seeking to admit all of these. I understand that they're  
5 mockups, they're exemplars, but they do not get into evidence  
6 as a general matter, any of these mockups.

7                   MR. CHAKRAVARTY: So we think it's important that they  
8 do because, first, you can't appreciate the intricacies of the  
9 fusing system unless you're handling it. It's one thing to  
03:16 10 pass it around; it's another thing to actually feel how heavy  
11 this thing is. It's important to see how the charges are  
12 separated from each other. I think based on his foundation,  
13 him saying, "This is how I assembled it," it goes to weight,  
14 literally and figuratively.

15                  THE COURT: I'll have to think about that.

16                  MR. WATKINS: One more: the kill switch. In  
17 Watertown -- I object to -- the mockup they have actually has  
18 the kill switch being inside of the pressure cooker itself, or  
19 at least as I viewed it. That's pure speculation. The kill  
03:16 20 switch shows no signs of burning. There was nothing to  
21 indicate it was on the inside.

22                  As he has testified, there is no evidence of the  
23 Christmas tree light that would be responsible, exploded or  
24 unexploded. Both the battery and this kill switch quite  
25 obviously were separate. Maybe they were going to do something

1 with that -- maybe Tamerlan was going to do something with  
2 that, but there was -- they were completely separate. It's  
3 pure speculation as to this mockup, certainly in his testimony,  
4 generally to say that there was a kill switch mechanism.

5 THE COURT: I think it's a matter for  
6 cross-examination, that point. You can expose that on  
7 cross-examination.

8 MR. WATKINS: Yeah.

9 THE COURT: Okay?

03:17 10 (In open court:)

11 BY MR. CHAKRAVARTY:

12 Q. Agent Knapp, based on this evidence that you -- was  
13 submitted to you, 949 and 949A, did you create a modified  
14 version of an exemplar transmitter that would be comparable to  
15 the one that was seized in this case?

16 A. Yes.

17 Q. And how did you make the modifications to the version of  
18 the device that you bought off the shelf?

19 A. Removed the trigger and the cutback on the throttle, put  
03:18 20 the battery pack up beneath where the LCD or the circuit board  
21 was. This stuff was -- like I said, we have all kinds of  
22 examiners in the FBI in our operational technology division.  
23 They have examiners there also. So evidence went over to them,  
24 besides in our laboratory, to determine examinations on  
25 particular items, whether they're with computers or like this

1 transmitter here that had gone over to them also.

2 But the modifications we made were like the modifications  
3 of that transmitter. And that transmitter basically was  
4 modified in such a way that when you turn on the power button,  
5 it's going to send a full output to that electronic speed  
6 controller which then is going to, you know, send the  
7 current -- all the current, to those where we talked about,  
8 those two outputs to the motor. And where that would have  
9 been, that's where the initiator -- the improvised initiator  
03:20 10 would have been, and it would have -- you know, it would light  
11 up.

12 Q. So instead of having to turn the throttle or to pull a  
13 trigger, just turning the transmitter on would send a full  
14 signal?

15 A. The power button on that Flysky, yes. When you turn that  
16 on, it would send a full output to the electronic speed  
17 controller because what it was seeing was a full reverse --  
18 like you were running the car full reverse.

19 Q. So, Agent Knapp, how sophisticated would you have to be in  
03:21 20 order to create the improvised explosive device you described?

21 MR. WATKINS: I'm going to object, your Honor.

22 THE COURT: Go ahead. You can answer.

23 THE WITNESS: You have knowledge of hobby cars, the  
24 components. You might do a little bit of a testing to make  
25 sure you, you know, get the right hookups. But commonly

1 available out there in the Internet, how to modify. There's  
2 other Internet sites out there. It's not that too  
3 sophisticated. I mean, if you know you have the components of  
4 the hobby car, once you use your transmitter, press a button,  
5 and you can get it to the output of the electronic speed  
6 controller, it's not too difficult of a system to build.

7 BY MR. CHAKRAVARTY:

8 Q. And you mentioned information is available on the Internet  
9 about that?

03:22 10 A. Right. Widely available on just R/C models and  
11 transmitters, different receivers, how to increase power to  
12 your cars. All these hobbyists out there that go around and  
13 fly planes or race cars.

14 Q. And so that's all with regards to the R/C component, the  
15 radio-controlled, remote-control component to this?

16 A. Right.

17 Q. How about the assembly of improvised explosive devices?

18 A. There's many sites out there available on the website.  
19 Some give you step-by-step instructions on how to build an IED  
03:22 20 or bomb.

21 Q. And have you seen pipe bombs many times in your career?

22 A. Yes.

23 Q. And the principles behind building a pipe bomb, are those  
24 pretty widely available as well?

25 A. Correct.

1 Q. Now, have you had a chance to review the *Inspire* magazine  
2 which details the instructions they propose to build an  
3 improvised explosive device?

4 A. Yes.

5 MR. CHAKRAVARTY: If we could call up 1142-91, page 3.  
6 Sorry. Next page, please.

7 Q. Agent Knapp, does this first section of the "how to"  
8 portion of this article say that there are two types of  
9 explosions? The first is a chemical explosion. "This  
03:23 10 explosive causes great pressure that would kill living beings  
11 within a certain radius. Examples are all the military-grade  
12 explosions such as TNT, CR and RDX." Did I read that first  
13 section properly?

14 A. Yes, just the chemical explosion and you have mechanical  
15 explosions.

16 Q. And so the type of IED that you've described on Boylston  
17 Street in Watertown, those are not chemical explosions, right?

18 A. Well, there was a chemical reaction for the low explosive,  
19 and then the container relieved and mechanically separated with  
03:24 20 the pressure being built up from the explosives.

21 Q. Okay. So does this article next go on to read, "The  
22 mechanical explosion: This results from the burning of an  
23 inflammable material within a confined space. An example is  
24 putting gunpowder inside an iron pipe with a small opening  
25 enough only for a fuse. When the gunpowder is ignited, great

1 pressure results from the gunpowder turning into gases, and  
2 which result in the exploding of the iron pipe, turning it into  
3 shrapnel flying at a high speed."

4 Did I read that properly?

5 A. Correct.

6 Q. And is that the type of explosion that you were describing  
7 earlier?

8 A. Yeah. I mean, it relieves the container, it relieves --  
9 just like any buildup of pressure, whatever that comes from,  
03:25 10 there's a buildup of pressure and it relieves the vessel or  
11 container.

12 Q. And does the *Inspire* magazine also suggest an elbow pipe,  
13 some flammable material which I think *Inspire* calls  
14 "inflammable substance," and then what appears to be a  
15 Christmas tree light?

16 A. Yes.

17 Q. Section B gives instructions on how to extract the  
18 inflammable substance. And does it say that -- does it propose  
19 to strike the head of the match softly?

03:25 20 MR. WATKINS: Your Honor, I'm going to object to  
21 Mr. Chakravarty continuing to read all of this. If he wants  
22 the witness to read...

23 BY MR. CHAKRAVARTY:

24 Q. Agent Knapp, if you wouldn't mind reading --

25 A. "Grind the substance and filter to obtain a fine powder.

1 In the picture you will see the fine powder and you will add  
2 sugar equivalent to one-quarter its quantity. Mix the two  
3 substances until they become uniform in color."

4 Q. What's the purpose of these instructions?

5 A. Basically to get a low explosion composition, harvest it  
6 off of matches, and stick a fuel in there and mix it up and you  
7 have a low explosive.

8 MR. CHAKRAVARTY: Next page, please.

9 Q. Preparation of the decoration lamp?

03:26 10 A. Yeah, this basically is telling you, you know, be careful  
11 how you open up a little Christmas tree bulb. Be careful of  
12 the filament, because if you break the continuity of that,  
13 you're not going to have an initiator. There's a little  
14 filament in there, and they say to carefully place it inside  
15 your low explosive. Just an improvised initiator using a  
16 Christmas tree bulb.

17 Q. And is that a process that takes some experience in doing  
18 effectively?

19 A. It's -- sometimes it can be tricky when you break that  
03:27 20 glass bulb and then you ruin the inside filament, but it just  
21 takes, you know, just a little bit of ability to crack the  
22 glass just right. But nothing too sophisticated about that.

23 Q. This next section talks about preparation of the iron pipe  
24 and it suggests drilling a hole in the pipe. Is that right?

25 A. Right. I mean, you have to insert your initiator somehow,

1       whether it was a Christmas tree light as they're talking this  
2 way, or just a piece of that green hobby fuse into your pipe.

3                    MR. CHAKRAVARTY: Next page, please.

4       Q. It says the final preparation. Can you read this, please?

5       A. "Pour some inflammable substance into the lamp. Do so  
6 gently in order not to tear the filament, which is very  
7 sensitive. The device will not explode if the filament is  
8 torn.

9                    "Insert the lamp into the pipe with the wires sticking  
03:28 10 out.

11                  "Fill the pipe with the inflammable substance. Avoid  
12 having any of the substance on the threads of the pipe so that  
13 it won't ignite when closing the pipe.

14                  "Wrap tape around the pipe to close the hole which was  
15 drilled into the pipe only leaving the wires sticking out. The  
16 tape will surround the wires, closing any gaps in the pipe and  
17 will not wrap around them."

18       Q. It continues down here.

19       A. "You may substitute the inflammable substance extracted  
03:28 20 from the matches by gunpowder used in cartridges but you may  
21 also use powder from fireworks instead. Note: You do not have  
22 to use one substance. You may mix together the substance from  
23 matches, gunpowder or fireworks, but in doing so, you'll need  
24 to mix them well," and it goes on to talk about electricity  
25 source.

1 Q. So just on the flammable substance they're talking about,  
2 those are all low explosives that they describe there?

3 A. Yeah, that's low explosive.

4 Q. Okay. Please continue with the electricity source.

5 A. "The importance of the electricity source in the explosive  
6 device is that it is the key in igniting the device. The  
7 electricity that is sufficient to turn on a small lamp is  
8 sufficient to cause an explosion. This electrical current may  
9 reach to the lamp directly through a battery, by a time circuit  
03:29 10 or by a remote-controlled circuit."

11 Q. And is the hobby car fusing system that you described  
12 earlier -- is that a remote-controlled circuit?

13 A. That's correct.

14 MR. CHAKRAVARTY: Next page.

15 Q. Now, did they give an example of the timed circuit here?

16 A. Yeah, they have chosen for you a timed circuit as it is  
17 simple. "We set up the circuit which is composed of a 9-volt  
18 battery, a wire connected to the plus of the battery and a  
19 nail, the red wire, a wire connected to the negative of the  
03:30 20 battery, and a test lamp, the black wire.

21 "Note: You may use any small lamp here. Take notice that  
22 this is not a lamp we filled before with the inflammable  
23 substance. We connect from the other pole of the lamp a green  
24 wire. When this wire touches the nail, the circuit is closed  
25 and the lamp should light."

1       This is simply a very basic -- you got a power source.  
2       The switch they have is the nail touching the other side of the  
3       wire, and the power source is hooked up and you have a little  
4       light and it will come on.

5       Q.     So far with the exception of the typos, are the  
6       instructions they've been giving consistent with how you  
7       understand an IED would work?

8       A.     Consistent with a fusing system, a simple fusing system,  
9       yes; that you could use in an IED, yes.

03:31 10                   MR. CHAKRAVARTY: Next page, please.

11       Q.     And then this page, it describes the --

12       A.     Modifying a mechanical clock in using two contacts. Once  
13       they touch, it's a switch. Just like in the previous, they use  
14       the nail to the wire. They're just using the hands of the  
15       clock with a wire. And once -- they're talking about using one  
16       of the hands, and once it comes and touches a nail, it  
17       completes the circuit, a simple circuit.

18                          MR. CHAKRAVARTY: Next page, please.

19       Q.     This middle section, is it more details about that timed  
03:31 20       explosive?

21       A.     Yeah, correct, using the timer to function up in the top,  
22       the light or how you could set it up to function that pipe  
23       bomb.

24       Q.     I want to focus in on this bottom section which talks  
25       about fragmentation. Can you read that?

1 A. Yeah. "It is important to put a quantity of small nails  
2 on the surface of the iron pipe from the inside. You do that  
3 by sticking them to the wall of the pipe by using glue. The  
4 pipe used here is a 2-inch one. The inflammable substance used  
5 to fill it was extracted from 80 match heads. The explosion  
6 that results from this device is a mechanical one. It results  
7 from the pressure caused by the gases and, therefore, it only  
8 works if contained in a high-pressure environment. So you may  
9 use iron pipes, pressure cookers, fire extinguishers or empty  
03:33 10 propane canisters. The point is that the inflammable substance  
11 needs to be" --

12 MR. CHAKRAVARTY: Next page, please.

13 A. -- "contained in a strong container that would allow the  
14 pressure to build up and thus cause a damaging explosion."

15 Q. All right. If I could ask you to stop there?

16 MR. CHAKRAVARTY: Your Honor, I think we were going to  
17 break a little early?

18 THE COURT: How much more do you have on this topic?

19 MR. CHAKRAVARTY: This topic, just to the end of this  
03:33 20 article. So just a couple more minutes?

21 THE COURT: Yeah, go ahead.

22 BY MR. CHAKRAVARTY:

23 Q. Now, they mention fragmentation such as small nails?

24 A. Right.

25 Q. Which of the devices in this investigation had small nails

1 as an apparent secondary fragmentation?

2 A. That was at Scene B.

3 Q. And that's the blast in front of the Forum restaurant?

4 A. That's correct.

5 Q. Would you please continue reading?

6 A. "However, in order to fill, for example, a pressurized  
7 cooker with the substance from matches, it would take a lot of  
8 matches to do so; therefore, you may want to use gunpowder or  
9 powder from fireworks.

03:34 10 "You need to also include shrapnel. The best shrapnel are  
11 the spherical-shaped ones. As you can see in the figures  
12 below, you need to glue them to the surface of your canister.  
13 If steel pellets are not available, you may use nails instead.  
14 Above is a 2-inch iron pipe with nails inside it. You fill the  
15 inflammable substance afterwards."

16 Q. Please continue.

17 A. "The next three points illustrated by the previous images  
18 are for shrapnel used with a gas canister. The shape of nails:  
19 You may place the nails in a mold or pour glue over them, and  
03:34 20 when dry you remove them from the mold, wrap the molded nails  
21 around the canister. After wrapping the shrapnel around the  
22 canister, empty the canister from the gas and open the valve  
23 and then fill it with the inflammable substance. Insert the  
24 lamp with the wires sticking out just as you did earlier with  
25 the iron pipe.

1       "With that said, here are some important steps to take for  
2 an effective explosive device: Place the device in a crowded  
3 area. Camouflage the device with something that would not  
4 hinder the shrapnel, such as cardboard."

5 Q. When it's talking about gas canister in this article, do  
6 you understand that to mean like a propane-gas-type canister  
7 or --

8 A. Any type of -- yeah, fire extinguisher, propane canister.

9 Q. And in this investigation did you recover materials such  
03:35 10 as cardboard --

11 A. Yes, we did.

12 Q. -- from each of the scenes, on Scenes A and B?

13 A. Correct.

14 Q. Read the iron pipe method.

15 A. "The iron pipe method is effective if more than one is  
16 used simultaneously. To do so, bundle one wire from each pipe  
17 together and then bundle the remaining wires together as you  
18 may see in the illustration to the bottom right. One bundle  
19 would represent the green wire which connects to the clock's  
03:36 20 hour arm. The other bundle connects to the...on the battery."

21 The negative of the battery.

22 Q. The negative terminal of the battery?

23 All right. Read this section, please.

24 A. "The pressurized cooker is the most effective method.

25 Glue the shrapnel to the inside of the pressurized cooker, then

1 fill in the cooker with inflammable material. Insert the  
2 prepared lamp into the inflammable material gently in order not  
3 to break the filament of the lamp. Then have the wires  
4 sticking out of the hole in the lid of the cooker. Wrap some  
5 tape around the hole to seal any openings and connect the wires  
6 to the electric source in the same way we did with the iron  
7 pipe."

8 Q. With regards to the non-electrical fusing system that you  
9 found from the Boylston Street devices, are these instructions  
03:37 10 consistent with what you uncovered in your investigation?

11 A. Right. They add the fragmentation, the shrapnel. They  
12 had the BBs in Scene A embedded with a sealant, and they had  
13 the fragmentation with the BBs and the small nails inside the  
14 pressure cooker in Scene B, in a sealant.

15 Q. And then you described earlier the nuance with getting the  
16 Christmas tree light done right?

17 A. That's correct.

18 Q. I'll conclude with this. Read the safety precautions.

19 A. "The following are a few safety precautions: Put your  
03:38 20 trust in Allah and pray for the success of your operation.  
21 This is the most important rule: To wear gloves throughout the  
22 preparation of the explosive to avoid leaving behind  
23 fingerprints. Three, this is an explosive device so take care  
24 during preparation and handling. In the article we covered one  
25 of the many ideas for a lone mujahideen. We ask Allah to

1 assist our brothers in targeting his enemies and we ask Allah  
2 to grant us victory."

3 MR. CHAKRAVARTY: This is a good place to break, your  
4 Honor.

5 THE COURT: All right. We'll take the recess at this  
6 point.

7 THE CLERK: All rise for the Court and the jury. The  
8 Court will take the lunch recess.

9 (The Court and jury exit the courtroom and there is a  
04:55 10 recess in the proceedings at 12:53 p.m.)

11 THE CLERK: All rise for the Court and the jury.

12 (The Court and jury enter the courtroom at 2:13 p.m.)

13 THE CLERK: Be seated.

14 BY MR. CHAKRAVARTY:

15 Q. Agent Knapp, you described earlier that some mockup  
16 devices were made, and you said that you had constructed the  
17 configuration of these mockup devices to comport to the devices  
18 that you've spoken about that were -- evidence of which was  
19 found in this case. Is that right?

04:59 20 A. Yes, that's correct.

21 Q. Did you bring those into court with you today?

22 A. Yes.

23 Q. And so do you have a mockup device for the Scene A  
24 pressure cooker bomb?

25 A. Correct.

1 Q. And that we'll call 1568. And for the Scene B pressure  
2 cooker bomb, is that 1569?

3 A. Correct.

4 Q. And then for the materials that -- the inert explosive  
5 materials that were in the Rubbermaid container that was found  
6 in Watertown, did you bring an inert facsimile of that  
7 substance?

8 A. Yes.

9 Q. Okay. And for the facsimile of that substance, we're  
05:00 10 going to mark that as 1570. And for the pressure cooker bomb  
11 at Watertown, is that 1571?

12 A. Am I supposed to be seeing something on the screen?

13 Q. You don't know the number. Okay. I'll show you.

14 Did you bring the mockup for the Watertown pressure cooker  
15 bomb?

16 A. Yes.

17 Q. And did you also bring the mockups for the two pipe bombs  
18 that were rendered safe in Watertown and you had mockups made?

19 A. That's correct.

05:01 20 Q. And are all of these helpful to explaining your testimony  
21 about how each of these devices worked?

22 A. For the fusing systems, yes.

23 Q. And can you explain how you approximated how much  
24 explosive material to put in?

25 A. Before the -- we said the volume of those Fagor pressure

1        cookers, half to full, estimated that it was about eight pounds  
2        if it was full to 16 pounds, and then of course the smaller one  
3        would have had less than the larger ones.

4        Q.      And about -- for the pipe bombs, you actually were able to  
5        collect the unexploded material from the Watertown devices. Is  
6        that fair to say?

7        A.      Well, they were -- like I said, they were rendered safe  
8        and the powder was taken out of them before they came down to  
9        us.

05:01 10      Q.      And did you approximate that -- sorry. In the mockups  
11     that you made there is no powder, correct?

12      A.      There is no powder.

13                  MR. CHAKRAVARTY: Your Honor, at this point I would  
14        ask permission to have SSA Knapp approach the podium with each  
15        of those exhibits and demonstrate -- or to show that -- each of  
16        the components of those exhibits to the jury.

17                  THE COURT: That's fine. It's ahead of the -- I'm not  
18        sure if you've worked out the lines of sight for counsel.

19                  MR. WATKINS: I'll move around if the Court doesn't  
05:02 20        mind.

21                  THE COURT: Move around or move to a spot?

22                  (Laughter.)

23                  MR. WATKINS: I will move to one spot and try my best  
24        to stay still.

25                  THE COURT: Okay. Go ahead. Proceed.

1 BY MR. CHAKRAVARTY:

2 Q. Agent Knapp, if you'll come to the podium here again.

3 A. (Witness complies.)

4 Q. Agent Knapp, just keep your voice up so everyone can hear  
5 what you're saying.

6 A. This was the pressure cookers from the mockup from Scene  
7 A, a hobby fuse coming out of it. Inside was the fusing system  
8 we talked about earlier. Now, we found fragments of cardboard  
9 taped up around, and then the inside -- I mean, the  
05:04 10 fragmentation was on the inside and it was with a sealant, and  
11 these were where the BBs were encased inside. We found this  
12 pink-like rosin paper encasing just on the outside. Those  
13 would have been placed in here.

14 And this was the -- what we talked about before,  
15 electronic speed controller. We have the Flysky receiver here.  
16 Here was the toggle switch, the power source. And off the  
17 electronic speed controller where the two outputs would go to  
18 the motor and an improvised initiator was connected in. And  
19 we're representing this as the lightbulb right here. But the  
05:05 20 improvised lightbulb would have been into the main charge, the  
21 low explosive.

22 Q. So when you say it would be into the main charge, meaning  
23 that --

24 A. Yeah, this is just represented in the bag because it would  
25 be pretty messy in here otherwise.

1       But anyway, this was placed inside the pot. You know,  
2 there was -- the tape was crossed over, you saw, in some of  
3 those pictures there, and then it was placed in the backpack.  
4 Into a backpack.

5       You know, this was found at Watertown, and this is the  
6 mockup of what was found there out of a bag. But this is  
7 actually what the controller would look like.

8 Q.      For the record -- one moment. Just for the record, you're  
9 holding up two transmitters. One appears to be a modified  
05:06 10 Flysky transmitter and one is an intact Flysky --

11 A.     Yeah, this is what it would have looked like where the  
12 pistol grip, the trigger control and the wheel for steering the  
13 car. That's the battery pack where it was cut off and placed  
14 underneath, and all these buttons here are gone, but the dials  
15 are still underneath it. So this was how that was found.

16 Q.     Now, just to clarify, the modified device you just held  
17 up, that's a mockup, not the original evidence that we saw --

18 A.     Yes, this is the mockup of the Flysky, what we found at  
19 the scene.

05:07 20 Q.     Agent Knapp, could you put the pressure cooker into the  
21 backpack?

22 A.     I mean, it is pretty heavy.

23            MR. CHAKRAVARTY: Your Honor, I would ask for  
24 permission -- first, with regard to all of these, I'll move  
25 them in -- or make a motion to move them into evidence, but if

1 I may ask to publish them in the backpack so that the jury  
2 can -- actually, maybe take it out of the backpack -- excuse  
3 me -- so the jury can actually see it close up.

4 MR. WATKINS: I object to actually admitting them.  
5 Passing them around, no problem.

6 THE COURT: I'll reserve on the admission, as we've  
7 discussed, but you may exhibit them.

8 BY MR. CHAKRAVARTY:

9 Q. Agent Knapp, if you would be so kind to pass around this  
05:08 10 device.

11 A. You want the lid --

12 Q. Take the lid off.

13 (The exhibit is published to the jury.)

14 Q. Agent Knapp, while the jury's looking at that, just to  
15 clarify, all of the powder that you have in these exemplars is  
16 inert and poses no danger from any of these devices?

17 A. That's correct.

18 (The exhibit is published to the jurors.)

19 Q. Agent Knapp, the configuration of the various components  
05:12 20 that are in the mockup, how did you arrive at that architecture  
21 given the fact that the devices that were used were actually  
22 exploded and you didn't have the original to model it after?

23 A. Well, like I said before, at the scene all the evidence  
24 that was collected, the damaged electronic speed controller,  
25 the Flysky, the battery parts and that really damaged toggle

1 switch, to have this operate, it has to be plugged up in such a  
2 way that leads -- the power source goes to the electronic speed  
3 controller in this fashion, the toggle switch was wired up  
4 coming off one of the -- we found the inputs into the  
5 electronic speed controller so it would basically break the  
6 signal when there was an output to this improvised Christmas  
7 tree.

8 So when you turn it on, where there's a slide switch here  
9 that initialized what we talked about, then it doesn't send an  
05:13 10 output to that light and it will trigger that light, it will  
11 flash. So there was an interruption, so a toggle switch was  
12 used to break that circuit momentarily until this initialized.  
13 And then this is in the off position right now as it stands,  
14 and they just have to go and turn it on so it will complete the  
15 circuit.

16 Q. Okay. Thank you. With regard to the transmitter that was  
17 modified, with the absence of the throttle and the trigger like  
18 you demonstrated, what would happen when you turned that on?

19 A. As I talked about before, the modification -- when they  
05:14 20 modified it from here, what would happen is when you turn this  
21 on, it would be like you were pressing this trigger full speed  
22 backwards, so there would be an output as soon as you turn  
23 on -- here's the power button, usually on the back. When you  
24 turn that on, it would send that output directly to the  
25 receiver, which then the electronic speed controller would

1 interpret it and send it to the output where the improvised  
2 initiator was going to be.

3 Q. And this is a Flysky transmitter and a Flysky receiver in  
4 this setup, correct?

5 A. Yes, that's correct.

6 Q. Thank you. Can we move on to Exhibit 1569, which is the  
7 Scene B exemplar? Or I should ask: Is there anything else  
8 about this that you haven't described?

9 A. Everything that was from the scene that we gathered up is  
05:15 10 represented here in this mockup.

11 Q. Thank you. Can we move on, then, to the Scene B exemplar?

12 A. Once again, there was a backpack that was concealing the  
13 device. Same-type pot, the Fagor. It had hobby fuse going  
14 into it as a second form of initiation if the R/C fusing system  
15 didn't work.

16 Like we talked about, at the scene what was collected,  
17 there was a power source which is basically just another Sub-C  
18 pack power source for a hobby car. This was the electronic  
19 speed controller and this would be the receiver. And this  
05:16 20 electronic speed controller, you know, the slide switch to  
21 initialize in this position here. There were -- the two  
22 outputs that would normally go to the motor is going to the  
23 improvised initiator, same type.

24 And the only difference is, you know, there was -- besides  
25 the BBs, there were these small steel nails that was embedded

1 into the -- with the BBs.

2 Q. But the fragmentation sleeve, that's in the sealant  
3 against the interior walls of the pressure cooker?

4 A. Right. And we saw that with the red rosin paper again and  
5 the fragmentation, and then it was also -- had tape on it again  
6 consistent with Scene A.

7 Q. Thank you.

8 MR. CHAKRAVARTY: Again, your Honor, I would ask to  
9 publish 1569, the Scene B exemplar.

05:18 10 THE COURT: All right.

11 THE WITNESS: And as far as demonstration purposes,  
12 there was a transmitter that, you know, we purchased off of  
13 those receipts that we talked about, the transmitter, receiver,  
14 and I have an unmodified transmitter here today.

15 BY MR. CHAKRAVARTY:

16 Q. That's because the transmitter for the Scene B device was  
17 not actually located, correct?

18 A. That is correct.

19 Q. So you bought one that was -- married the receipt that we  
05:18 20 saw earlier?

21 A. Yes.

22 Q. Please publish the -- this device. If you can hand it to  
23 Juror No. 1.

24 (The exhibit is published to the jurors.)

25 Q. Now, significantly, Agent Knapp, there's no toggle switch

1 on this device. Is that correct?

2 A. Yeah. Like we talked about earlier, that once you  
3 initialized it, it didn't have enough output, or there was no  
4 current going to that improvised initiator, so there was none  
5 needed.

6 Q. Thank you, Agent Knapp.

7 If we could move on to Exhibit 1570. This is the  
8 Watertown evidence -- sorry -- Watertown mockups.

9 Agent Knapp, let's first start with the pressure cooker  
05:23 10 device, Exhibit 1571. Can you explain the architecture of that  
11 mockup?

12 A. Yeah, it was a Fagor. There was cardboard -- circular  
13 cardboard found, that was burnt and charred, at the scene also.  
14 There was a toggle switch with wire found, basically a 9-volt  
15 battery. Like I said before, there was no improvised initiator  
16 attached to this, but there was a length of wire with just a  
17 simple flip up on-and-off toggle switch.

18 Q. None of the circuitry that we saw in the other two devices  
19 existed in the Watertown pressure cooker?

05:24 20 A. No. And there was the same type of construction with the  
21 BBs, pink/red -- the pink rosin paper was found at the scene  
22 with the fragmentation.

23 Q. And was there also an alternate fusing system?

24 A. Well, there were holes poked through here, through the  
25 cardboard which was damaged and burnt. And basically, hobby

1       fuse, when it burns, it's going to go away. So the primary  
2       means of initiation would have been this hobby fuse, and you  
3       have that as a secondary type of initiation.

4       Q.     Okay. And how does this device compare in relative weight  
5       to the other two devices that the jury just saw?

6       A.     Half the weight.

7       Q.     Fair enough. Thank you.

8                  Let's move on to the two pipe bomb exemplars, 1572.

9                  Agent Knapp, just one more question on that Watertown  
05:26 10       device as you're opening that bag. The pieces of the Watertown  
11       pressure cooker were more intact than those on Boylston Street.  
12       How would you attribute that? How would you explain that?

13       A.     That is correct. I mean, pretty much the whole base of  
14       that pot was just crumbled and crushed. But as far as -- an  
15       explosion happened, but that could have been due to  
16       confinement. That was more than likely thrown and the lid  
17       probably was -- came un- -- I mean, we found no evidence of any  
18       tape around it. So if the lid did come unseated, you know,  
19       it's still intact and it's almost acting like a projectile.  
05:26 20       And it just basically violently flew in one direction, and I  
21       believe that was found embedded --

22                  MR. WATKINS: I'm going to object, your Honor.

23                  THE WITNESS: -- in pictures --

24                  THE COURT: That's all right. Overruled. Go ahead.

25       You can continue.

1                   THE WITNESS: -- into a car.

2 BY MR. CHAKRAVARTY:

3 Q. Thank you. Please move on to the pipe bombs.

4 A. It's simple. Your loads are Home Depot 2-inch-diameter  
5 pipes. You can put any powder in, but basically it was  
6 fragmentation. And in some of the ones that did go off, you  
7 can see the circular impressions in some of the pieces that  
8 they also had fragmentation in the pipe. It was just a simple  
9 hobby fuse lighted and you throw it.

05:27 10 Q. Now, there's some tape on the threads of the end caps. Is  
11 that --

12 A. Right. I mean, usually -- yeah, we -- in our training  
13 we'll make what -- we use Vaseline basically so you cause no  
14 friction. A possible low explosive can ignite it. Like we  
15 read in that manual before, that *Inspire*, about be careful, you  
16 know, threads. So Teflon just to ease so there's no friction  
17 buildup between the threads.

18 Q. And just speaking of tape, were there various tapes  
19 submitted as evidence in this investigation?

05:28 20 A. Yeah, there was numerous types of tape: black electrical  
21 tape, this Teflon tape, duct tape, clear packing tape. Just  
22 commonly available items seen over the years of being put in a  
23 device, like I'm taping up the hobby fuse or taping up wires  
24 together, but it's just available material used to construct a  
25 device.

1 Q. And in addition to that tape, there's some electrical  
2 tape, it looks like, on both of these devices?

3 A. When it came in, there was electrical tape on the  
4 initial -- or the actual devices, yes.

5 Q. And each of these mockups represents a rendered-safe  
6 intact device?

7 A. That is correct.

8 Q. So we don't know exactly what the other pipe bombs that  
9 exploded may have looked like?

05:29 10 A. Right. They were just fragmentation, pieces of the pipe.

11 Q. And is the elbow, 90-degree elbow pipe, similar in terms  
12 of construction?

13 A. Yeah, just they -- a 90-degree pipe.

14 MR. CHAKRAVARTY: Your Honor, I would ask to publish  
15 1572.

16 THE COURT: Okay.

17 BY MR. CHAKRAVARTY:

18 Q. I'm sorry. "Publish" means to give it to the jury.

19 A. The pot too?

05:30 20 Q. No, just those two -- the pipes; not the pot.

21 (The exhibit is published to the jurors.)

22 Q. While they're doing that, let's set up the next one.

23 Exhibit 1570 is the plastic bag of powder that you just placed  
24 on counsel table. If you wouldn't mind retrieving a piece of  
25 evidence in the Rubbermaid container.

1 A. (Witness complies.)

2 Q. You just picked up Exhibit 854 which was the -- well, what  
3 is it?

4 A. This is the container that approximately three pounds of  
5 low explosives were recovered in, and it had -- in the lid it  
6 had a hole in it and it had three pieces of hobby fuse coming  
7 out of it.

8 Q. All right. And if you wouldn't mind just placing the --  
9 1570, the bag, into the container and holding it up?

05:31 10 A. (Witness complies.)

11 Q. Agent Knapp, if you would hold up Exhibit 854 containing  
12 Item 1570. Would you take off the lid just so the jury can get  
13 a sense of how much of that Rubbermaid container was filled.

14 A. And of course, there was all the hobby fuse that was  
15 packed in here amongst the powder.

16 Q. And was the hobby fuse lying on top of the powder?

17 A. Yes.

18 Q. And the hobby fuse itself has some explosive material in  
19 it. Is that correct?

05:35 20 A. That's correct.

21 Q. And was the strand of hobby fuse sticking out through the  
22 top of that lid?

23 A. Yeah, there was three pieces.

24 Q. Thank you. And, Agent Knapp, we're done showing  
25 the -- these exhibits to the jury. I just wanted to ask you to

1 put that away, and then we'll do a demonstration of the exhibit  
2 1568 and 1569, with the Court's permission.

3 MR. CHAKRAVARTY: I'm seeking the Court's permission  
4 to do that demonstration.

5 THE COURT: Okay.

6 MR. CHAKRAVARTY: Thank you.

7 THE COURT: I don't know what the demonstration  
8 entails. It's kind of a blank check.

9 (Laughter.)

05:36 10 BY MR. CHAKRAVARTY:

11 Q. So, Agent Knapp, if you would take the remote control  
12 transmitter for each of those mockups and perhaps resume the  
13 witness stand. And you place each of these devices either on  
14 the podium or I can hold one.

15 (Pause.)

16 A. Like I said before --

17 THE COURT: Why don't we have a question.

18 MR. CHAKRAVARTY: Yeah, thank you.

19 BY MR. CHAKRAVARTY:

05:37 20 Q. Thank you. Agent Knapp, first of all, you've taken off  
21 the lid of Exhibits 1568 and 1569, correct?

22 A. Yes, correct.

23 Q. And each of the -- each of those receivers for each of  
24 those radio-controlled devices has been bound to the respective  
25 transmitters. Is that accurate?

1 A. Yes, that's correct.

2 Q. And how did you learn to do that?

3 A. Basically, R/C hobby model cars, there's instructions out  
4 there widely available, there's manual -- instruction manuals  
5 that come. And based on the evidence collected, as I said  
6 before, I put it into the appropriate configuration as the  
7 fusing system would have been in Scene A.

8 Q. Do the instruction manuals for each of those devices also  
9 have the binding procedures?

05:38 10 A. It's a simple process where you bind the receiver to the  
11 transmitter, you turn on the power on the receiver, and then  
12 there's a bind -- there's this little bind button up here that  
13 you press in and then you turn the power on, and then there's a  
14 blinking light. And then once it's bound, it stays solid. And  
15 then you remove the little binding plug and you put the plugs  
16 into the appropriate channel in the receiver and get ready  
17 to -- you know, if you had a hobby car, you would get ready to  
18 drive, steer it, move it.

19 Q. And is the Flysky receiver bound to the Flysky transmitter  
05:39 20 that you brought?

21 A. The modified, yes.

22 Q. The modified transmitter? And the Spektrum receiver is  
23 bound to the Spektrum exemplar that you had purchased as well?

24 A. That is correct.

25 Q. In your experience in making these mockups and testing

1 them, was one transmitter capable of activating the other  
2 receiver?

3 A. As I said, they use two different forms to communicate.  
4 Spektrum uses a digital sequencing and the Flysky uses  
5 sequencing hopping. So the transmitter and the receiver have  
6 to have that type of technology so they can communicate with  
7 each other. That has the digital sequencing and the Flysky has  
8 the frequency hopping.

9 Q. So they don't communicate?

05:40 10 A. No.

11 Q. You described an arming procedure that's required for each  
12 of the receivers, for the receiver-electronic speed controller  
13 combination.

14 A. But you have to initialize each one. Basically there's a  
15 little slide switch from the electronic speed control you turn  
16 on and it powers it up, and then it goes through its little  
17 sequence, and then it's waiting for the signal from the  
18 transmitter to receive an input.

19 Q. And so can you position the Christmas tree light for each  
05:40 20 of these devices in a way that the jury can see whether the  
21 light turns on.

22 A. (Witness complies.)

23 Q. Now, in the improvised explosive device, that Christmas  
24 tree light filament would be embedded in the explosive  
25 material. Is that right?

1 A. Yes.

2 Q. So now, if you can arm each of the devices and then resume  
3 the witness stand with the respective transmitters?

4 A. Okay.

5 Q. I'm sorry. Is there anything else that you need to  
6 describe about what you're doing?

7 A. No. Basically, it's turned on. You can see there's power  
8 coming to it. And right now it's in the safe-arm position. So  
9 when you turn it on, it wouldn't get a little blink on the  
05:41 10 light. And if it was on -- do you see that blink -- that would  
11 cause the power to detonate it.

12 Q. Agent Knapp, you're going to have to get back to a  
13 microphone.

14 A. So I'm going to go to the safe arm -- I'm going to take it  
15 off the safe arm -- I'm going to put it on safe. It's  
16 initializing, and in a couple of seconds, and then I'm turning  
17 it on. Now all I have to do is press this button to turn the  
18 receiver on.

19 Q. Okay. And you've pressed the modified Flysky transmitter  
05:42 20 and it's activated, the device, 1568, the Scene A mockup?

21 A. Correct.

22 Q. Now, please go on to 1569, the Scene B mockup.

23 A. Once again, there's a slide switch here. But we didn't  
24 know the configuration of this transmitter, the controller.  
25 But the slide switch is on and it's armed. And then you just

1 have to put an input from this transmitter to it.

2 Q. And you've depressed the transmitter in the exemplar,  
3 Spektrum transmitter, and it has activated the Christmas tree  
4 light on the 1569, Scene B mockup. Is that right?

5 A. Correct.

6 Q. Now, you obviously did that here at close range. And you  
7 don't know the exact range of each of these devices. Is that  
8 right?

9 A. That's correct.

05:44 10 Q. When you activated one of the transmitters, it did not  
11 activate the Christmas tree light on the other receiver. Is  
12 that correct?

13 A. That's correct.

14 MR. CHAKRAVARTY: That's all I have, your Honor.

15 THE COURT: Mr. Watkins, do you want the witness there  
16 or on the stand?

17 MR. WATKINS: I would like to start off there.

18 THE COURT: Okay. Fine.

19 CROSS-EXAMINATION

05:44 20 BY MR. WATKINS:

21 Q. Good afternoon, Agent Knapp.

22 A. Good afternoon.

23 Q. 1568 is this one, correct, from Scene A?

24 I'm going to move this over to counsel table.

25 THE COURT: Mr. Watkins, you stay near the microphone

1 too, please.

2 MR. WATKINS: I will. I know I have a soft voice.

3 THE COURT: It's not just for the room; it's for  
4 transmission to other rooms as well.

5 BY MR. WATKINS:

6 Q. Now, Agent Knapp, as I understand it, it's -- the two  
7 switches on here, right, this one has to be turned on. The  
8 problem is when this one turns on, this immediately does a  
9 little cycle that would light up the Christmas tree light and  
05:45 10 that would ignite, right?

11 A. Correct.

12 Q. And that's why it needed this added feature of this arming  
13 switch, right?

14 A. That's a safe-and-arm toggle switch.

15 Q. Safe-and-arm toggle switch. Because then it runs its  
16 cycle, you can put that switch on, and then it's ready to go,  
17 right?

18 A. It's waiting for input from the transmitter.

19 Q. From the transmitter.

05:45 20 Now, this battery pack here, this doesn't last forever.  
21 Like any other battery pack, you have to recharge it. It will  
22 lose power over time, correct?

23 A. That's correct.

24 Q. And not only will it lose power, but if it's on all the  
25 time, it will drain the battery. The battery will go dead,

1 right?

2 A. Well, if you're not putting an input and you're running  
3 the motor and the battery is then being drained because you're  
4 speeding around on your hobby car.

5 Q. Correct. Or it's just the electronic speed controller  
6 takes a certain amount of energy itself, right?

7 A. There's a little bit of energy. But not like taking it  
8 and driving the car on the motor.

9 Q. Of course. So in order for this to work, this has to be  
05:46 10 charged up. It has to have a charge in it, right?

11 A. That's correct.

12 Q. And then it would go into this pressure cooker pot.

13 Now, I saw -- I think the jury saw there are actually two  
14 pieces of cardboard in each of these pressure cooker bombs,  
15 right?

16 A. Right.

17 Q. And that is consistent with what you found on the street  
18 at each scene, there were two kind of -- I mean, there were  
19 shards but you could identify two of these, right?

05:47 20 A. There was -- yes, there was two. Well, there was  
21 cardboard, very fragmented, with duct tape around it of a  
22 circular nature, yes.

23 Q. And two pieces at each site, right?

24 A. Well, and then Watertown, I think there was three without  
25 duct tape on it.

1 Q. So you put both of these in. But you don't know what the  
2 order, for example, of these pieces of cardboard were in there,  
3 right?

4 A. No.

5 Q. And indeed, this one could be on top and -- where did our  
6 lid go? There it is. Go on top like that?

7 A. Sure.

8 Q. So going back, then, to this arming switch, you could turn  
9 this on, but at some point when you're getting to use it, this  
05:48 10 safe arm switch is the last thing that's going to happen to  
11 make it operational, correct?

12 A. Yes.

13 Q. Okay. So one would flip the switch and put it back in  
14 here and then put this down on here and close it up, and then  
15 all we could do is wait for the signal from the transmitter,  
16 right?

17 A. If it was on, yes.

18 Q. So again, the last thing that actually went inside when I  
19 just did that was this piece of cardboard, right?

05:48 20 A. Yes.

21 Q. I think I'm done here. If you could go back to the stand,  
22 I'll go back to my usual spot.

23 MR. WATKINS: I'm actually not getting any screens at  
24 this point.

25 THE COURT: No, you're not. What do you want, the

1 computer?

2 MR. WATKINS: Yes, please. There we are.

3 BY MR. WATKINS:

4 Q. You talked a little bit about what your role became once  
5 the bombing happened on April 15th. You stayed down in  
6 Quantico, and part of what you did was intake evidence there,  
7 right?

8 A. Yeah. I was down in Quantico, in the explosives unit, and  
9 the evidence started coming down to the laboratory.

05:50 10 Q. And so when that came in, you would identify -- or you  
11 would help identify it as maybe part of an explosive item that  
12 would be within your purview? In other words, items would come  
13 down, this might be involved with an explosive device, it goes  
14 to Agent Knapp -- or you would decide it goes to Agent Knapp in  
15 the explosives unit?

16 A. That was decided at -- once an explosive event or  
17 explosive case, it would come through our unit, and an examiner  
18 was assigned. And I was the examiner that was assigned to this  
19 case.

05:50 20 Q. And because there were -- I think you said really  
21 thousands of items of evidence that were tied to the explosive  
22 device, right?

23 A. Yes, there was over 1300 individual submissions of items  
24 that came in.

25 Q. And some of those had sub-items that went to hundreds of

1 items, right?

2 A. There was a lot, yes.

3 Q. I'm showing you --

4 MR. WATKINS: I think this is in evidence, your Honor,  
5 but perhaps it should just go to the witness to make sure.

6 Q. Do you recognize what is depicted on the screen?

7 A. Fragmented remains of cardboard.

8 Q. And that's identified as Q199?

9 A. That's correct.

05:51 10 Q. And was that one of the items that you listed in your  
11 report as being associated with the bombs?

12 A. Correct; it was listed in my report.

13 Q. And now, I do believe this is in evidence as part of 623  
14 because I think I've seen it there, but we don't have sub  
15 numbers for that. I'm going to ask my colleagues if they could  
16 determine. Otherwise, I'll admit it separately.

17 THE COURT: It doesn't hurt to admit it separately.

18 MR. WATKINS: Then I would move for admission of  
19 Defendant's Exhibit 3093.

05:52 20 MR. CHAKRAVARTY: No objection, your Honor.

21 (Defense Exhibit No. 3093 received into evidence.)

22 MR. WATKINS: While that's being shown on the screen,  
23 may I approach, please?

24 BY MR. WATKINS:

25 Q. You, in your report, identified this as fragments of

1 cardboard collected at Scene A. Is that correct?

2 THE COURT: Are you getting the picture?

3 THE JURORS: No.

4 MR. WATKINS: Oh, I'm sorry.

5 THE COURT: Now? Okay. Sometimes there's a delay.

6 BY MR. WATKINS:

7 Q. Is that right, you identified a number of items?

8 A. I've identified a lot of items, but I don't have my report  
9 available, so...

05:53 10 Q. Your report is 108 pages long?

11 A. That's correct.

12 Q. Did you -- I thought you told Mr. Chakravarty that you  
13 looked over your report before you came in today?

14 A. I looked over the report previously.

15 Q. I'm sorry?

16 A. I had looked over it previously, but not this morning or  
17 today.

18 Q. But just sitting here now, you know that cardboard came  
19 in, and that was analyzed and found to be part of one of the  
05:54 20 bombs?

21 A. Correct.

22 Q. And you talked about the multidiscipline -- the different  
23 disciplinary areas within the FBI laboratory, right? You  
24 talked about fingerprint identification, you talked about  
25 chemistry, you talked about -- what else, firearms

1 identification, I think, DNA? There's all kinds of different  
2 disciplines within the lab, right?

3 A. Correct. There are multiple disciplines within the  
4 laboratory.

5 Q. And part of what you do when you see something come in for  
6 analysis is to also help to determine where that should go  
7 next, in other words, whether it should go to another  
8 discipline either after you've seen it or after you've done  
9 your full analysis?

05:54 10 A. Yes. There's what we call an examination report where the  
11 evidence is flowing through the laboratory, what disciplines  
12 get certain particular pieces of items which will then  
13 eventually -- once those examiners do their examinations, then  
14 the evidence will be coming back over to the explosive unit, to  
15 myself, to analyze the bits and pieces of the parts.

16 Q. In the early stages of the Boston Marathon bombing case,  
17 all of the disciplines communicated with each other. There  
18 were daily meetings about the evidence, right?

19 A. Basically there was an exam plan started. And depending  
05:55 20 on what it was, it went to those examiners, and then it went to  
21 the next examiner, whatever discipline that was, and -- but  
22 there was other communication going on.

23 Q. And there were, indeed, daily meetings about the evidence  
24 and the -- what should be analyzed and how far people had  
25 gotten with their analysis on the Boston Marathon bombing case,

1 right?

2 A. Right. That was a bigger picture -- I mean, the lab was  
3 doing its part, but then there was these daily meetings with  
4 our FBI headquarters and other FBI entities involved in this  
5 case.

6 Q. Ms. Clarke has helped me out. Can I refresh you with your  
7 report about Q199 came from?

8 A. Sure.

9 Q. It's on the computer here. So you could see the heading  
05:56 10 from your report. Don't read it, but I want to point out where  
11 you are. And you recognize that as something you would do on  
12 your report?

13 A. Yeah, the various Q items, right.

14 Q. Right. And then if you scroll down to the next page,  
15 we're looking for Q199. Yeah, there we go.

16 A. Right.

17 Q. So does that refresh your recollection where Q199 came  
18 from?

19 A. From Scene A.

05:57 20 Q. And when you're talking about Scene A, that's the Boston  
21 Marathon bombing Scene A?

22 A. Correct.

23 Q. So to get back to Q199, these shreds, they were sent to  
24 other disciplines for analysis also, right?

25 A. Yes, that's correct.

1 Q. The shreds from Q199 which was found at Scene A was sent  
2 for fingerprint analysis. Is that correct?

3 MR. CHAKRAVARTY: Objection, your Honor, to this line.  
4 Not to this question but to the --

5 THE COURT: Well, you can have this question.

6 BY MR. WATKINS:

7 Q. Did it get sent for analysis?

8 A. Yes.

9 Q. Do you know whether positive results of a fingerprint  
05:58 10 analysis were done?

11 MR. CHAKRAVARTY: Objection, your Honor.

12 THE COURT: Sustained.

13 BY MR. WATKINS:

14 Q. Showing you the remains of the backpack that were found at  
15 Scene B, Boylston, marathon bombing, do you recognize that and  
16 do you recognize the Q number? It's hard to read, but I think  
17 Mr. Chakravarty put this up for you just before.

18 A. That looks like Q51?

19 Q. This would be Q11.

05:59 20 A. Q11.

21 Q. Do you know what --

22 A. Remains of a backpack.

23 Q. And inside of that backpack were remnants of pieces of  
24 paper?

25 A. Yeah, correct.

1 Q. Do you know whether that was sent for fingerprint  
2 analysis?

3 A. Yes, that was sent for analysis.

4 Q. And do you know whether there were results obtained?

5 MR. CHAKRAVARTY: Objection, your Honor.

6 THE COURT: Sustained.

7 BY MR. WATKINS:

8 Q. Showing you a picture of Exhibit 974, do you recognize  
9 that as the lid recovered in Watertown that came to you for  
06:00 10 analysis?

11 A. Yes.

12 Q. And that's the pressure cooker lid?

13 A. Correct.

14 Q. Do you know whether that item was sent for fingerprint  
15 analysis?

16 A. A lot of these items basically were sent out to the  
17 various disciplines. That one would have been sent out also  
18 looking for fingerprints.

19 Q. And the reason to send something out from an explosives  
06:01 20 point of view, a metal surface like this can capture  
21 fingerprints pretty easily, correct?

22 MR. CHAKRAVARTY: Objection, your Honor.

23 THE COURT: Sustained.

24 BY MR. WATKINS:

25 Q. The FBI has a protocol about what order things are to be

1 analyzed in, a general protocol?

2 A. If they're looking for trace, possibly DNA or latent  
3 fingerprints, that would -- depending on what we're looking  
4 for, a combination, it could go to latents first for visuals;  
5 come back if they're looking for trace evidence, hair or other  
6 things; or it might end up going to DNA to take a swab and a  
7 sample. It just all depends what's the evidence, what piece  
8 of -- what it is and then where it's going to go first.

9 Q. And those were the kinds of decisions that were being made  
06:02 10 at Quantico as each of these pieces of evidence came in?

11 A. As it came into the lab and then examined, a plan was  
12 established. And evidence just kept coming in, and the various  
13 disciplines and examiners were getting this evidence and doing  
14 their examinations on it.

15 Q. Now, I want to move to the transmitters that you talked  
16 about as the fusing system. There was a lot of testing done on  
17 these particular transmitters, and you talked about people  
18 buying exemplars and things of that nature?

19 A. We -- the explosion unit, we ended up purchasing these  
06:03 20 products, yes.

21 Q. That's what I'm getting at. It was a "we." It was a  
22 group effort; it wasn't you doing all of these particular  
23 things, right?

24 A. There were other examiners in our unit purchasing, and  
25 some individuals going out, looking for the type of pots that

1 were used, yes.

2 Q. Now -- but they also did independent testing of the  
3 circuits and tried to make sure that -- well, they came to the  
4 conclusion that you reported here about these transmitters  
5 binding to these receivers, right?

6 MR. CHAKRAVARTY: Objection, your Honor. Objection.

7 THE COURT: Sustained.

8 BY MR. WATKINS:

9 Q. And they issued a report, right, of their own about the  
06:03 10 transmitters and receivers?

11 MR. CHAKRAVARTY: Objection.

12 THE COURT: Let me see you at the side.

13 (Discussion at sidebar and out of the hearing of the  
14 jury:)

15 MR. CHAKRAVARTY: The government was restricted from  
16 incorporating the very same type of testimony that the defense  
17 is now attempting to elicit, but this is something beyond his  
18 expertise. He just simply looked at results of other -- the  
19 other disciplines, and in some cases he incorporated reference  
06:04 20 to the fact that other people had done their own independent  
21 tests in his report. But he didn't adopt the findings of all  
22 of those in order to make his assessment.

23 I mean, that would pull the sting out of whatever  
24 Mr. Watkins was going to do, had he been transparent about the  
25 strategy of first bringing it out on cross.

1                   MR. WATKINS: No, I did it in a very evenhanded way.  
2 He testified on direct that he didn't know what the distance  
3 that each one of them could go on was. The report actually  
4 says, quite specifically, what the distance of each of the  
5 transmitter receiver pairs was.

6                   That's all I was doing, was gearing up to do a kind of  
7 refresh recollection with him with these reports. And that's  
8 why I was asking about the reports. That's the one and only  
9 question.

06:05 10           THE COURT: He didn't testify to it.

11                  MR. WATKINS: No. Mr. Chakravarty asked him "Do you  
12 know what the distance is" --

13                  THE COURT: And he said no.

14                  MR. WATKINS: He said, "I don't know," but he knows  
15 this report and he does know. There were a lot of things he  
16 did not know until he prepared for testimony today using those  
17 kinds of reports.

18                  THE COURT: It looks like you're trying to  
19 cross-examine your own evidence. I mean, you want to get it in  
06:05 20 so you can criticize it.

21                  MR. WATKINS: No.

22                  THE COURT: I'm not following this.

23                  MR. WATKINS: All I want to get in is the distance  
24 that -- one of the transmitters had a distance of 572 feet; the  
25 other one had 1100 feet. The evidence is that our client kind

1 of raced away from the one scene, and it goes to his  
2 sophistication concerning, you know, what he knew about the  
3 particular item and its attributes.

4 MR. CHAKRAVARTY: Any information about the range was  
5 not from this witness; it was from this other expert who was  
6 doing his own independent analysis. He didn't incorporate that  
7 into his findings and he didn't do it.

8 MR. WATKINS: That's not true. It is in his report.  
9 It is in his report.

06:06 10 MR. WEINREB: We have good reason to exclude it under  
11 403 grounds because the purpose of this examination is to  
12 suggest that Tamerlan Tsarnaev could have detonated that second  
13 bomb, which the defense has no good-faith basis for suggesting  
14 because they know that it's not --

15 THE COURT: I don't know because he's already -- well,  
16 anyway.

17 MR. WATKINS: Your Honor, I just want to correct one  
18 thing. It is absolutely in his report. He does adopt the  
19 distances. It's in there.

06:07 20 MR. CHAKRAVARTY: Here's the report. It very well may  
21 be. It's 108 pages. If you want to find that.

22 THE COURT: The fact that it's in the report isn't a  
23 basis for admitting it, necessarily. You need something more  
24 than that. He testified on the subject and said that he  
25 doesn't know.

1                   MR. WATKINS: And so I can refresh his recollection.

2                   THE COURT: You could try to refresh his recollection,  
3 but that's not what you started to do. If you want to put the  
4 report in front of him and see if that refreshes his  
5 recollection --

6                   MR. MELLIN: But, your Honor, the problem with this is  
7 there's no good-faith basis for what -- they're trying to argue  
8 that Tamerlan had both receivers -- or both transmitters, and  
9 that is the only reason they're raising this issue. They don't  
06:07 10 have a good-faith basis and they can't argue that.

11                  MR. WEINREB: And this will just mislead and confuse  
12 the jury and it should be excluded under 403 grounds. It is a  
13 critical issue in the case. The defense knows it's not true.  
14 They have no good-faith basis for suggesting it. Introducing  
15 it will mislead and confuse the issues and, therefore, it  
16 should --

17                  MS. CONRAD: Judge --

18                  MR. WEINREB: -- be excluded on 403 grounds.

19                  MS. CONRAD: -- if two prosecutors can speak, can two  
06:08 20 defense attorneys speak?

21                  THE COURT: Go ahead.

22                  MS. CONRAD: Thank you. First of all, the government  
23 -- and the Court has allowed the government to introduce in  
24 terms of whether it's his finding or not his finding, and  
25 experts rely on others' testing. And they've been allowed to

1 introduce what he's learned from others, so it seems to me that  
2 that's fair ground.

3 Second of all, it's either impeachment or refresh your  
4 recollection.

5 Third of all, it seems to me whether or not we can  
6 address an issue that was specifically addressed on direct  
7 examination, which is the range of these -- it seems to me  
8 that's a no-brainer. We can. And what we're going to argue  
9 from it or not argue from it is for another day. I don't think  
06:08 10 the government can just put us off from addressing something  
11 that's relevant.

12 THE COURT: No, I think it's a fair Rule 403 question,  
13 but I don't know the answer. So give me something more about  
14 why there's no good-faith basis. I mean, somebody knows  
15 something to the opposite?

16 MR. WEINREB: Yes; the defendant.

17 MS. CONRAD: That's ridiculous. I mean, to say the  
18 defense can --

19 THE COURT: Keep your voice down.

06:09 20 MS. CONRAD: To say that -- I don't think we're there  
21 yet, first of all. But second of all, to say that the defense  
22 can't argue something that -- to which there exists -- as to  
23 which there is contrary evidence is ridiculous because, first  
24 of all, that's like saying that in an identification case if  
25 your client told you he was guilty, you can't argue mistaken

1 identification. That's Defense 101. This also goes to the  
2 issue that the government claims that was Jahar's apartment.

3 THE COURT: Okay. I will exclude it on the 403  
4 grounds.

5 MS. CONRAD: May I just have a clarification? 403 --

6 THE COURT: For the reasons argued by Mr. Weinreb.

7 MS. CONRAD: I don't understand.

8 (In open court:)

9 BY MR. WATKINS:

06:10 10 Q. I'm showing you what's been identified as Exhibit 1160-02.  
11 That is the receipt Mr. Chakravarty showed you for an order.  
12 Do you recall that?

13 A. Correct.

14 Q. What is the date on that particular order? Oh, I'm sorry.  
15 This is not -- this is already in evidence? There. What is  
16 the date on that receipt?

17 A. February 8th of 2013.

18 Q. And whose name is on the receipt for that R/C car that you  
19 have the exemplars from?

06:11 20 A. Tamerlan Tsarnaev.

21 Q. Showing you 1431 --

22 THE COURT: These are all in, right?

23 MR. WATKINS: Yes.

24 BY MR. WATKINS:

25 Q. -- which Mr. Chakravarty showed you on direct. Let me see

1 if I can find the date on this one. Can you -- what is the  
2 date on that purchase?

3 A. It's 4/8/13.

4 Q. And that is seven days before the Boston Marathon bombing?

5 A. April 8th.

6 Q. And these are for parts that were related to the second  
7 Boston Marathon bombing, Scene 2?

8 A. This was the Spektrum products, I believe.

9 Q. And I think you testified the Spektrum was related to  
06:12 10 Scene B, the second Boston Marathon bombing?

11 A. That's correct.

12 Q. Mr. Chakravarty showed you *Inspire* magazine and the alarm  
13 clock pages from that. Do you recall that?

14 A. Yes.

15 Q. And there's no mention in *Inspire* magazine about  
16 radio-controlled cars as a fusing system. Is that right?

17 A. The portion I read at, no.

18 Q. And what I think you've told us is that this is something  
19 that can be easily found out on the Internet by searches?

06:13 20 A. Correct.

21 Q. Were you aware that Tamerlan Tsarnaev searched the  
22 Internet for radio-controlled cars in the months leading up to  
23 the Boston Marathon bombing?

24 MR. CHAKRAVARTY: Objection, your Honor.

25 THE COURT: Sustained. Sustained.

And I remind the jury that unanswered questions produce no evidence.

MR. WATKINS: That's all I have, your Honor.

MR. CHAKRAVARTY: Nothing further.

THE COURT: Agent, thank you. You may step down.

(The witness is excused.)

MR. WEINREB: Your Honor, the United States calls Dr. Jennifer Hammers.

MR. MELLIN: Your Honor, if we may have a moment to move the screen for Dr. Hammers for the issues we raised before with the medical examiners?

THE COURT: Oh, move the screens? Yes. I'm sorry. I didn't know which screen you were referring to. Yes.

Again, as we did, there will be some autopsy photographs, and so the public monitors will not display them. The jury will see them. They are vivid photographs.

JENNIFER HAMMERS, M.D., duly sworn

THE CLERK: State your name, spell your last name for the record, keep your voice up and speak into the mic.

THE WITNESS: Sure. My name is Jennifer Hammers,  
H-A-M-M-E-R-S.

DIRECT EXAMINATION

BY MR. WEINREB:

Q. Good afternoon.

A. Good afternoon.

1 Q. Where do you work?

2 A. I work for the Office of Chief Medical Examiner for the  
3 City of New York.

4 Q. What type of work do you do?

5 A. I'm a forensic pathologist, also known as a medical  
6 examiner.

7 Q. What does a forensic pathologist or medical examiner do?

8 A. So a medical examiner, their duty is to investigate  
9 sudden, unexpected or unnatural deaths, to perform autopsies,  
06:15 10 and utilize that information as well as investigative  
11 information to determine why somebody passes away, and to fill  
12 out a death certificate indicating the reason that they passed  
13 away.

14 Q. Where did you go to school and tell us about any degrees  
15 you earned.

16 A. Sure. So I went to college at Geneva College in Beaver  
17 Falls, Pennsylvania, where I earned a bachelor of science. I  
18 then went to medical school at Lake Erie College of Osteopathic  
19 Medicine in Erie, Pennsylvania, where I got my degree to be a  
06:16 20 physician. After I finished medical school, I did a residency  
21 in anatomic and clinical pathology at Allegheny General  
22 Hospital in Pittsburgh, Pennsylvania.

23 I then went to the New York City medical examiner's office  
24 where I did my fellowship training in forensic pathology. And  
25 I also stayed for a second year of fellowship, specifically in

1 neuropathology and cardiac pathology, which is a specific study  
2 of the heart and the brain in forensic-related cases.

3 Q. What jobs have you held since completing all of that  
4 training?

5 A. After I finished my fellowship in New York City, I came to  
6 Massachusetts to work for the medical examiner's office for the  
7 Commonwealth of Massachusetts. I worked here for just about  
8 three years before going back to the medical examiner's office  
9 in New York City to work about a year and a half ago.

06:17 10 Q. Approximately how many autopsies have you performed?

11 A. I've performed about 2,000 -- a little over 2,000  
12 autopsies.

13 Q. Have you ever testified as an expert forensic pathologist  
14 before?

15 A. Yes, I have.

16 Q. How many times?

17 A. About 45 times.

18 Q. What years did you work at the Massachusetts Office of the  
19 Chief Medical Examiner?

06:17 20 A. So I worked here in Massachusetts from around September of  
21 2010 to the end of June 2013.

22 Q. So you were working here during the time of the marathon  
23 bombings?

24 A. That is correct.

25 Q. Was Dr. René Robinson one of your colleagues?

1 A. Yes, she was.

2 Q. Did you perform autopsies according to the same standards  
3 and procedures as she did when she -- as she does at that  
4 office?

5 A. Yes, I do -- I did, yes.

6 Q. On April 16, 2013, did you perform an autopsy on Krystle  
7 Marie Campbell?

8 A. Yes, I did.

9 Q. Did you determine the manner of her death?

06:18 10 A. Yes, I did.

11 Q. What was the manner of death?

12 A. The manner of death that we determined -- that I  
13 determined was that she passed away from a homicide.

14 Q. What was the cause of her death?

15 A. The cause of death was that she passed away from blast  
16 injuries to her torso and to her lower extremities.

17 Q. What are blast injuries?

18 A. So blast injuries are injuries that are caused from some  
19 type of explosion force. And typically there are two types of  
06:18 20 injuries that occur: One is from a wave of energy that can  
21 cause injury to the body, typically, to the inside of the body,  
22 mostly to organs that have air in them, like the lungs and the  
23 gastrointestinal system.

24 The other way that people have injuries, blast injuries,  
25 is physical injuries from objects from an explosive device or

1 the surrounding area that can actually cause injuries to the  
2 body: injuries to the skin, to the muscle and subcutaneous  
3 tissue and to the organs.

4 Q. How does the shrapnel from a bomb injure your skin, your  
5 organs and so on?

6 A. So objects that injure the body typically cause cuts and  
7 tears to the body. They can cause bruises or contusions or  
8 scrapes or lacerations both to the surface of the body but also  
9 deeper into the body.

06:20 10 Q. And you mentioned that the cause of death was injury to  
11 Krystle's torso and lower body, her legs, essentially?

12 A. That's correct.

13 Q. All right. Did she also suffer injuries to her head?

14 A. Yes, she did.

15 Q. What kind of injuries?

16 A. She suffered injuries that were blast-related to her head.  
17 There was singeing of the hair over the back of her head from  
18 the heat of the explosion. She had some scrapes or abrasions  
19 to her neck; she had a pellet -- it was small, like around the  
06:20 20 sizes of a BB -- that was embedded into the back of her ear;  
21 and she also had some contusions or bruising to both the front  
22 of her tongue and the right side of her tongue adjacent to the  
23 area of her teeth.

24 Q. What injuries did she suffer to her body?

25 A. So to her torso, she also suffered blast-related injuries

1 that included thermal injuries, or heat-related injuries. She  
2 had a large area of a burn over her back right side and a  
3 little bit over the back of the upper right arm near the armpit  
4 area. She had evidence of small punctate abrasions and  
5 contusions, or scrapes and bruises, over the back side of her  
6 body that was consistent with small pellets that I found both  
7 outside of her body, inside of her clothes, and also inside of  
8 her body.

9 And she had some black powder residue that was  
06:22 10 particularly over the area of the back of her armpit area. She  
11 had some thermal changes, or burns to her clothes, as well as  
12 defects consistent with the pellets that I found in some of her  
13 clothing, particularly, her shirt and tank top and bra that she  
14 was wearing.

15 Q. Did she have any injuries to her arms and legs?

16 A. Yes, she did.

17 Q. Can you describe those, please?

18 A. Sure. So on the back of her left hand there was some  
19 black powder residue that I noticed, and over the middle finger  
06:22 20 of her left hand she had a somewhat elongated abrasion or  
21 scrape, and around that scrape there were three punctate  
22 defects in the skin, again, of a similar size to those that I  
23 saw in the clothing, over her back and also in her skin over  
24 her back, about the same size as the pellets that I found.

25 Most of her injuries were on the back of her right arm and

1 then to her lower legs. So on the back of the right arm, in  
2 addition to what I previously described, there was also a large  
3 area over the back of the right arm that had stippling, or very  
4 small, fine punctate abrasions or scrapes to the skin over the  
5 back of the right arm.

6 On the lower legs, from the upper thighs down to the feet,  
7 there were injuries. So there were several very large, gaping  
8 injuries to the skin, the subcutaneous tissues and the muscle  
9 of both the front and the back of the lower legs. There were  
06:24 10 also several smaller injuries. So the larger injuries measured  
11 up to about ten inches, probably about from, like 5 or 6 inches  
12 up to 10 inches, and the smaller injuries were about 1 to 2  
13 inches in greatest dimension each. Many of them were very  
14 deep, through the whole surface of the skin, into the muscle.

15 The injuries on the surface of the skin had -- many of  
16 them had smoother edges to them and some were slightly  
17 irregular. There were -- so they had a sharp aspect to them  
18 but also a more blunt, or tearing aspect to them. Some of them  
19 had some material that was embedded into the wound itself.

06:24 20 So there were three pieces of flat, slightly  
21 irregular -- slightly irregular-edged pieces of metal. One I  
22 found between the pants and the skin in the area of the right  
23 groin, and then two I found actually embedded into the skin and  
24 the muscle of the back of the left leg.

25 I also found in some of the wounds some pellets that were

1 similar to what I had found on the outside of the body, and  
2 also some clear silicone-type material that had -- some of  
3 which had pellets embedded into the material and then some of  
4 which I could see that pellets had been embedded into the  
5 material but were no longer present.

6 There was a fracture of the femur bone on the left side,  
7 which is the bone in the thigh, and there was also a fracture  
8 and a laceration, or a tear, to the skin over the area of the  
9 bunion in the -- on the left foot.

06:25 10 Q. So her left foot and her femur in that same leg were  
11 shattered?

12 A. Well, the femur was broken completely through at the lower  
13 aspect of the femur, so closer to the knee than to the hip, and  
14 the bone in the foot had multiple small fractures in that area  
15 of where the bunion is.

16 Q. Is that consistent with blast injuries?

17 A. Yes, both of those actually are. Yes.

18 Q. How does a blast shatter bone?

19 A. So the injury to the foot appeared like -- so the skin had  
06:26 20 a long, like, laceration or tear to the skin, and it -- what it  
21 appeared to be was that something had grazed up against the  
22 skin and deep enough to reach the bone of the foot as it was  
23 traveling along the foot.

24 The fracture to the leg, to the bone in the thigh, can  
25 occur from many types of different injuries, but certainly from

1 a blast type of injury where a force is put onto the body, that  
2 can cause a break to the bone.

3 Q. Is that painful?

4 A. A fracture to the femur?

5 Q. Yes.

6 A. Yes, that would be very painful.

7 Q. I'd like to show you a photo that has been marked as  
8 Exhibit 652 for identification. Do you see that?

9 A. Yes, I see it.

06:27 10 Q. Do you recognize that?

11 A. Yes, I do.

12 Q. What is it?

13 A. This is a photograph of Ms. Campbell's body, from  
14 approximately her shoulders down to her feet, showing some of  
15 the injuries that I've already discussed.

16 Q. Was that taken during the autopsy?

17 A. Yes, it was.

18 MR. WEINREB: The government offers 652.

19 MR. BRUCK: Noting our prior objection.

06:28 20 THE COURT: All right. Admitted. I will display it  
21 to the jury.

22 (Government Exhibit No. 652 received into evidence.)

23 BY MR. WEINREB:

24 Q. Can you point out the sites of the injuries that you just  
25 described?

1 A. Sure.

2 Q. And if you like, if you press hard on this screen with  
3 your finger, you can circle things and then clear them by  
4 pressing in the upper right-hand corner.

5 A. Okay. So on the legs, I had described some of the larger,  
6 gaping injuries that went through the skin and also through the  
7 subcutaneous tissues, or fat, and into the muscle. You can see  
8 one of the larger wounds that I just circled in yellow.

9 There's another here, and then there's another also on the back  
06:29 10 of the leg here that we can see in this picture.

11 So these wounds show that the edges along the skin have a  
12 slightly -- have a somewhat smooth surface to them, and so the  
13 object causing these would have somewhat smooth edges, but also  
14 deep within the wound in the muscle, you can see that the  
15 muscle is actually -- doesn't have a smooth wound through it  
16 but, rather, it has more of a lacerated defect, or an irregular  
17 tearing of the muscle as opposed to being just from a smooth  
18 object.

19 On the right leg, which is closest to the yellow arrow  
06:30 20 that I circled, you can see that the edges of the wound are  
21 slightly more irregular and not quite as smooth as the injury  
22 on the left thigh that I just described.

23 So these are three of the wounds that I had previously  
24 described. There's one more injury that I did not yet  
25 describe, which I'll circle. It's this long, or linear area,

1 of contusion or bruise. This was present on both her right  
2 inner thigh and her left inner thigh. It's in the area of the  
3 seam of her jeans. And this can occur when the legs are  
4 pressed up against each other in a forceful way where the seam  
5 actually causes a pattern bruise in the area of the -- on the  
6 skin in the area of the seam of the jeans.

7 Q. Okay.

8 MR. WEINREB: 655 for the witness, please.

9 Q. Do you recognize that photo?

06:31 10 A. Yes, I do.

11 Q. Is that also a photo that was taken during the autopsy?

12 A. Yes, it is.

13 MR. WEINREB: The government offers 655.

14 THE COURT: Okay.

15 (Government Exhibit No. 655 received into evidence.)

16 MR. BRUCK: As previously noted.

17 THE COURT: Yes, of course.

18 BY MR. WEINREB:

19 Q. What's this a photo of?

06:31 20 A. So this is the photo of the back side of Ms. Campbell,  
21 showing again her back and the back aspect of her arms and legs  
22 from her shoulders down to her feet.

23 Q. The big red mark on her back, what is that?

24 A. So the large red area on her back is the burn that I had  
25 previously described to her skin.

1 Q. What level of burn is that?

2 A. So this burn appeared to be a third-degree burn.

3 Q. Is that the most severe kind?

4 A. Essentially, beyond a third-degree burn, there would be  
5 charring of the skin or actual burning of the tissue. So  
6 without that, yes, this is the most severe.

7 Q. And the wounds, the big, gaping holes in her legs, were  
8 those the wounds you described earlier?

9 A. Yes, they are.

06:32 10 Q. And was it in there that you found shrapnel and metal  
11 pieces and the BB-sized objects that you described earlier?

12 A. Yes, that's correct.

13 MR. WEINREB: Exhibit 654 for identification, please.

14 Q. Do you recognize that?

15 A. Yes, I do.

16 Q. What is that a picture of?

17 A. This is a very close up picture of some of the wounds on  
18 the back of her leg that I previously described. And the  
19 smaller wound that's to the left side of the screen -- it's in  
06:33 20 the middle but just to the left -- has a piece of that flat,  
21 slightly irregular but slightly sharp metal embedded into the  
22 wound that I had described that I had recovered from some of  
23 the wounds.

24 MR. WEINREB: The government offers 654.

25 THE COURT: All right, with the same conditions, yes.

1 MR. BRUCK: Thank you.

2 THE COURT: Published.

3 (Government Exhibit No. 654 received into evidence.)

4 BY MR. WEINREB:

5 Q. Can you please indicate -- just by tapping the screen it  
6 will leave an arrow -- where you found that metal shard?

7 A. Sure. So the piece of metal is in the wound that the  
8 arrow is pointing to. It's sort of on end, so that in the  
9 photograph you're seeing the thin aspect of it.

06:34 10 MR. WEINREB: May I have Exhibit 656 for the witness,  
11 please.

12 Q. Do you recognize that?

13 A. Yes, I do.

14 Q. And just I'm going to show you two more.

15 MR. WEINREB: 659 for the witness, please.

16 Q. Do you recognize those?

17 A. Yes, I do.

18 MR. WEINREB: And 651 for the witness.

19 Q. Do you recognize those?

06:34 20 A. Yes, I do.

21 Q. What are they?

22 A. So they're three photographs of the material that I've  
23 previously described that I collected from the wounds in the  
24 body.

25 Q. These are FBI laboratory photos, not your own photos. Is

1 that right?

2 A. I believe the second two are. The first one may be as  
3 well.

4 Q. But you had an opportunity to review them and compare them  
5 to your notes and to the evidence, and these are accurate  
6 photos of the items you removed from Krystle's body?

7 A. Yes, they are.

8 MR. WEINREB: The government offers those three  
9 exhibits.

06:35 10 THE COURT: All right.

11 (Government Exhibit Nos. 651, 656 and 659 received  
12 into evidence.)

13 MR. WEINREB: If we could have Exhibit 656, please.

14 BY MR. WEINREB:

15 Q. So could you describe where you found that item?

16 A. Yes. So this is one of the flat pieces of metal.

17 THE COURT: Just one second. I have to resend it.

18 THE WITNESS: Oh, I'm sorry.

19 THE COURT: Did you get it?

06:35 20 THE JURORS: No.

21 THE COURT: Okay. Go ahead.

22 BY MR. WEINREB:

23 Q. Go ahead.

24 A. Okay. So this is one of the flat pieces of metal taken  
25 from one of the wounds in the back of the leg that has slightly

1 sharp, but also slightly irregular, margins.

2 Q. I'm going to hand you what's been marked as several  
3 exhibits. While I do, do you want to put on some gloves?

4 A. Sure.

5 Q. We've marked these as 660-A, 659-A, 658-A, 657-A, and  
6 661-A for identification. I'm going to ask you to open those  
7 and tell me if you recognize the objects inside, if you don't  
8 mind.

9 A. Sure. Do you have a particular order you want me to do it  
06:36 10 in?

11 Q. No, you can do it in any order.

12 A. Okay.

13 (Pause.)

14 A. This is 658-A.

15 Q. Just continue.

16 A. Oh, sure.

17 (Pause.)

18 A. Would you like me to pull all of these out?

19 Q. Yes, please.

06:39 20 (Pause.)

21 A. I think I have them all open.

22 Q. All right. Dr. Hammers, do you recognize those items?

23 A. I do.

24 Q. What are they?

25 A. They're multiple envelopes that contain swabs/foreign

1 material that I collected at the time that I did the autopsy on  
2 Ms. Campbell.

3 Q. Okay. And what's pictured in 656, is that one of the  
4 items that you removed from her body?

5 A. It is -- so in the photograph, that is an item that I took  
6 from her body at the time of autopsy, yes.

7 MR. WEINREB: And can we have 659 on the screen,  
8 please.

9 Q. Do you recognize those items?

06:40 10 A. Yes, I do.

11 Q. What are they?

12 A. These are the three larger flat pieces of metal that I  
13 recovered at the time of the autopsy.

14 Q. And 661, please. Do you recognize that?

15 A. Yes, I do.

16 Q. What's that?

17 A. This is one of the envelopes -- the contents of an  
18 envelope that I collected at the time of the autopsy. It shows  
19 multiple pellets and the white silicone-type material both that  
06:41 20 contains some pellets but also contains imprints of where  
21 pellets used to be.

22 Q. Okay. So you said earlier that the cause of death was  
23 blast injuries, but how does that actually cause someone to  
24 die? How did it cause Krystle Campbell to die?

25 A. So Ms. Campbell passed away because she received injuries

1 not only to the surface of her skin and her muscle, but also in  
2 the process of those injuries occurring, blood vessels in her  
3 lower legs were cut or transected which caused bleeding. So  
4 the reason that she passed away is because she lost a  
5 significant amount of blood in a short enough period of time  
6 that her body couldn't make more blood in order for her to  
7 survive.

8 Q. And based on the nature of the injuries that you observed  
9 during the autopsy, can you estimate how long it took her to  
06:42 10 bleed out, how long she lived?

11 A. I can in a general kind of way.

12 Q. What's the estimate?

13 MR. BRUCK: I'd like to be heard, your Honor.

14 THE COURT: You want to be heard, is that it?

15 MR. BRUCK: Yes.

16 THE COURT: All right. I'll see you at the side.

17 (Discussion at sidebar and out of the hearing of the  
18 jury:)

19 MR. BRUCK: The only expert opinion that was provided  
06:43 20 in discovery under Rule 16 was that her death would not have  
21 been instantaneous. There is no estimate of the period of  
22 time. We would like to know what the estimate is and see if we  
23 would object to it. I don't think we've been provided notice.

24 THE COURT: What do you expect her answer to be?

25 MR. WEINREB: I expect her answer to be up to one

1 minute. And given the nature of the particular injuries in  
2 this case, it was probably closer to the one-minute side than  
3 the zero side.

4 However, I would like to state that first, the  
5 indictment in this case is not something that the defendant  
6 murdered people, it was that he actually committed a terrorist  
7 act. He terrorized the entire population, and causing people  
8 to die in a particular manner, a manner that caused them to  
9 bleed to death, to suffer pain while they were dying. And that  
06:43 10 the disclosure that the death was not instantaneous subsumes  
11 the idea that she was alive at least some seconds after  
12 the -- I mean, we're not going to say that she lived for days  
13 or for hours or something that will obviously require --

14 THE COURT: Okay.

15 MR. WEINREB: -- more elaborate disclosure.

16 THE COURT: Okay. I think "up to a minute" is  
17 consistent with "not instantaneous."

18 MR. BRUCK: Well, we then further object to the  
19 speculation that it was probably more closer to one minute than  
06:44 20 closer to -- we don't think that that's -- there's any likely  
21 basis for it.

22 There's also -- it's speculative because there's no  
23 telling how soon she would have passed out for other reasons  
24 having to do with blast injuries. It's just complete guesswork  
25 and it's inflammatory. There's nothing to base it on.

1 MR. WEINREB: That's what cross-examination is for.

2 THE COURT: Your objection is noted, but I'll allow  
3 it.

4 MR. BRUCK: Okay.

5 (In open court:)

6 BY MR. WEINREB:

7 Q. So, Dr. Hammers, do you remember the question?

8 A. Yes, I do.

9 Q. Okay. So what's your estimate of how long Ms. Campbell  
06:45 10 likely lived?

11 A. So Ms. Campbell would have been able to survive for a  
12 period of time from seconds up to even approximately a minute  
13 or so after she sustained the injuries.

14 Q. And is there anything about the nature of the injuries  
15 that allows you to offer a medical opinion on whether it was  
16 closer to seconds or closer to a minute?

17 A. Yes.

18 Q. What is that?

19 A. So people who pass away from blood loss, they have to live  
06:45 20 for a period of time in order for their heart to keep pumping  
21 for them to continue to bleed. So people who have injuries to  
22 smaller blood vessels take a longer period of time to lose a  
23 sufficient amount of blood. They need to lose about half of  
24 their blood volume quickly.

25 So if there's injuries to smaller blood vessels as opposed

1 to larger blood vessels, a person would be able to survive for  
2 a longer period of time, closer to the minute mark, as opposed  
3 to closer to the few seconds mark.

4 Q. And in Ms. Campbell's case, what injuries did you observe?

5 A. So in Ms. Campbell's case, she had injuries to both the  
6 arteries and the veins in her lower extremities. So while  
7 these certainly aren't extremely small vessels, they aren't  
8 some of the largest blood vessels in the body.

9 Q. And so based on the nature of those injuries, you would  
06:46 10 estimate that she could have lived for up to a minute?

11 A. That's correct.

12 MR. WEINREB: No further questions.

13 MR. BRUCK: Thank you, Dr. Hammers. We have no  
14 questions.

15 THE COURT: No examination?

16 All right, Doctor. Thank you. You may step down.

17 MR. WEINREB: Your Honor, if I neglected to offer the  
18 exhibits that I listed earlier, then I offer them at this time.

19 THE COURT: The A exhibits?

06:47 20 MR. WEINREB: The A exhibits.

21 THE COURT: Yes, all right. You did not but they'll  
22 be admitted.

23 (Government Exhibit Nos. 657-A, 658-A, 659-A, 660-A  
24 and 661-A received into evidence.)

25 THE COURT: That's as far as we'll go today, jurors.

1 It's Thursday. You have the next three days to yourself. I  
2 hope you enjoy them.

3 Again, please avoid any discussion of the case, any  
4 interaction with people in person or on the Internet or  
5 whatever, and avoid news accounts as much as you can. We'll  
6 resume on Monday morning with the evidence in the case.

7 THE CLERK: All rise for the Court and the jury. The  
8 Court will be in recess.

9 (The Court and jury exit the courtroom and the  
10 proceedings adjourned at 4:02 p.m.)

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1 C E R T I F I C A T E  
23 We, Marcia G. Patrisso, RMR, CRR, and Cheryl  
4 Dahlstrom, RMR, CRR, Official Reporters of the United States  
5 District Court, do hereby certify that the foregoing transcript  
6 constitutes, to the best of our skill and ability, a true and  
7 accurate transcription of our stenotype notes taken in the  
8 matter of Criminal Action No. 13-10200-GAO, United States of  
9 America v. Dzhokhar A. Tsarnaev.10  
11 /s/ Marcia G. Patrisso  
12 MARCIA G. PATRISSO, RMR, CRR  
Official Court Reporter13 /s/ Cheryl Dahlstrom  
14 CHERYL DAHLSTROM, RMR, CRR  
Official Court Reporter15 Date: 10/19/15  
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